THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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ELECTRICITY IN MINES.

WE give on another page a table showing the aggregate electrical horse-power in British and Irish mines, compiled from the reports of H.M. Inspectors of Mines for the eight divisions.

From this it will be seen that Scotland leads the way in the number of collieries which have installed electricity as well as in the amount of power plant installed underground, though this district is much below South Wales when the totals of underground and surface plant are taken together, that of the latter amounting to no less than 149,393 H.P., against a total of 98,357 H.P. for Scotland.

It is not a little remarkable how rapidly the development of electricity has taken place in South Wales, especially with regard to winding, ventilation, haulage and underground pumping. The district is undoubtedly the wealthiest of our coalfields, and could best of all afford to continue working with steam and compressed-air plant; but as enormous sums have been spent in putting down central stations for generating power, it follows that substantial economy in working must have been demonstrated.

The same thing has been experienced in Scotland, but mainly with regard to underground work, such as haulage, pumping, and coal cutting (portable machinery), the latter item being remarkable when compared to all the other districts.

Probably, however, the most difficult case to understand is that of the two North of England districts of Newcastle and Durham. In total H.P. these two districts are below either South Wales or Scotland, yet there is at hand a public supply, much of which is generated from waste heat, viz., that of the Newcastle-upon-Tyne Electric Supply Co. and the various companies associated with it, who are able to supply energy at rates, if not below, at least equal to what it could be generated for at the colliery itself. They are also the oldest mining districts not only in this country, but in the world, and if economy is needed anywhere it certainly is necessary here. It is true that the number of collieries in the two districts is less than in either Scotland or South Wales, the totals being for Scotland 520; Newcastle, 246; Durham, 248; and South Wales, 622. Of these, 39 mines in Cumberland must be deducted from Newcastle, which are included in that district, and seven mines from the Durham district which are outside the Supply Co.'s area, so that we have in Northumberland 129 collieries, and in Durham (including the Cleveland iron mines) 319, or together a total of 448 mines and collieries, 80 per cent. of which could probably be easily supplied by the electricity supply companies. There is ample room for the development of electric winding, and if it pays in South Wales, where the initial expenditure included the generating stations in most cases, surely it ought to pay in these two counties where there is only the cost of the motors to consider; it is not even necessary to install a complete new winder, as in most cases the present drums can be utilised, and if the silly prejudice against gearing were removed, the operation of conversion would be a simple one, and smaller motors with higher efficiency might be installed with very profitable results.

In Cumberland also there would appear to be ample opportunity for the development of electricity, especially seeing that there are a number of collieries with waste heat from coke ovens. There are 39 collieries, with a combined output of 2,133,563 tons of coal, yet only 12 collieries have installed electricity, and this only to the extent of 2,974 H.P.,

none of which is applied to either winding or ventilation, and only 473 H.P. to underground haulage.

One might also have expected greater development in the Yorkshire district, seeing that there were at work in 1912 no fewer than 630 pits, of which 317 only have electrical plant. Of the 317, 64 are in Derby, 43 in Nottingham, and 210 in Yorkshire, the total number of mines being in Derby 155, Nottingham 57, and Yorkshire 417, so that nearly 80 per cent. of the owners in Nottingham have recognised the advantages of electricity, the highest percentage, we believe, for any county in the British Isles. Many of the collieries in Derby are poor, as the whole output for the 155 mines was only 15,468,880 tons, valued at £5,899,685, as compared with an output in Nottingham of 11,122,832 tons, valued at £4,241,499, for only 57 collieries.

It is in the Doncaster district, however, in Yorkshire, that the greatest development may be expected, as very large collieries are being established, each capable of producing at least 1,000,000 tons a year. It certainly seems a pity that the coal owners in this area have not combined for their mutual benefit in the establishment of a central generating station, and the adoption of electricity for all the operations—including winding—incidental to the working of the colliery.

There are 555 mines in the Southern Division, 299 of which are in Staffordshire, which is the greateat coal-producing centre in the division, though, of course, great hopes are still held out for Kent, which, at present, is the least. In Kent there are 7 mines which produced 1,099 tons, valued at exactly £1,099, or £1 per ton, and we very much question whether any of the shareholders would get a scrap of profit at this price. It proves, however, that there is coal in Kent, but it takes a lot of getting! A lot of other people besides ourselves wonder why. Three of the mines have electricity established mainly for pumping water out of the pits, and we hope it will prove of such good service that later on it will be used for winding coals out of the pits, and at £1 a ton.

The Diesel Accidents.

In connection with this matter, there has followed considerable discussion on the Bray and other accidents since the issue of the Official Report. In the report, and by some who have entered into the discussion since it was published, our contention, expressed at the time of the Bray explosion, that there should be a check or reflux valve in the blast air pipe has been doubted. The Inspector seemed to think that a reflux valve might stick fast, and so be useless. But even if it does stick open and allow one explosion, this does not mean that the valve has *caused* the explosion, for the valve is just then in the position of a plain unchecked pipe. And for one stick-fast permitting, by not preventing, an explosion, there might be two, or twenty-two, occasions when the valve would not stick fast, and would prevent an accident. It can never be known how many accidents are prevented by a safeguard, but it is usually well known when a safety appliance fails to act. Safety valves often stick fast, but we never yet heard this awkward fact put forward as an excuse for not applying safety valves to boilers. On the contrary, it is the reason why *two* safety valves are always applied, for by the theory of chances the two are unlikely to stick at the same time, especially when there is reasonably careful attendance and the rule for daily testing, by making a valve blow, is carried out.

One writer says the check valve would be blown in pieces by the excessive pressure. Why should it be? Let it consist of a steel or bronze ball held freely in a suitable retainer inside a stout steel casing, and it is not likely to be burst. If also the junction pipe is of copper from the retainer to the engine and of solid-drawn steel from the retaining valve to the blast vessel, the chances are that the copper pipe will burst, and the blast vessel will blow its pressure away harmlessly through the reflux valve, which if a ball should seat itself by gravitation, by a vertical rather than a horizontal movement. A lesson to be learned is that the blast pipe should be long, and that the air blast pressure should not be used when low, even though it may act, for there is little doubt that occasionally the pressure in the engine cylinder has gone a long way beyond 500 lb., especially when oxygen has been employed—a thing that is hardly likely to occur in the future, now that a belated publicity has been given to the very serious accidents already caused by its use. As to the danger of blowing to pieces a small reflux valve, what of the still greater danger of exploding the larger casing of the labyrinth which it has been suggested should be employed instead to check the progress of a flame through the blast pipe. The labyrinth may be efficacious and based on sound principles, but it can hardly be rated as a positive piece of apparatus such as a reflux valve is, up to the limit of its strength against disruption. The larger article will be the more likely to be burst, but a stout reflux valve, with a ball, is easily made stronger than the copper pipe, which at Bray seemed to burst before the air vessel, for we read of a blue flame being seen to run along it.

Nothing so far has been advanced in the controversy to make it otherwise than essential to place one reflux valve, if not two, in the course of the blast pipe, for, as said above, it cannot cause accident, and though it might fail on occasion like any other mechanical appliance, it would generally act. Obviously, the ball should have a short lift, and should not be able to get far away from the direct vertical above its seating.

Rubber.

The rubber market has lately drifted on to quieter lines, there being considerably less doing in shares, where comparative somnolence has prevailed, and the rot in prices has been checked even though the outlook has not materially improved. The better class of shares seems now to be fairly steady, but at prices terribly below those of the boom period, and there is very little chance of any substantial part of the depreciation being recovered, at all events until fundamental conditions of the industry assume a very different appearance from those of to-day. Nevertheless, the position as a whole has steadied itself a little, and it is the fond hopes of the optimists that things are now heading towards a small revival in the confidence which for so long has been conspicuously missing from the market. At the plantation rubber auctions held at Mincing Lane every fortnight, the tendency lately has been steadier, and it really almost appears as if prices had touched bottom or near it. Truly there cannot be much further depreciation, for at current selling rates plantation companies cannot in many cases live, and failing a recovery to a better figure, it can be only a matter of time before estates are abandoned, while the reconstruction of companies will be rendered inevitable.

Already this reconstruction process has been unpleasantly in evidence, and it is not yet done with by any means. It is in order to help matters along that there has been so much discussion recently as to the formation of an organisation for the purpose of putting the selling arrangements of the various producing companies upon a different and sounder basis. It may be taken for granted that wild rubber at to-day's prices is doomed. So far as Brazil is concerned, rubber cannot be produced there at anything like to-day's selling prices of plantation, and though Para material is held for a premium, it is doubtful if this can persist, for there is a growing belief in plantation rubber being much cheaper intrinsically than wild Para, and if this extends far it will not be long before the outlet for the wild product is narrowed further. Already it has been cut down pretty considerably in one way and another, and any fresh interference with its uses might have a rather sharp effect. It is almost impossible for economies to be introduced into the collecting of wild rubber in the Amazon Valley, hence any material reduction in the costs of procuring this description of material is rather improbable, but it is quite possible for considerable cutting down to be made in respect to the cultivated product.

All efforts are now being bent to this end, and some tangible result will, no doubt, be effected. There is a wide difference between the costs of the producing companies in the Middle East, and there can be no doubt that the

balance sheets of the better managed and lower cost properties are receiving the very closest attention from the directors of the higher cost properties with a view to the reducing of costs. Anything that can be done to place costs upon a permanently lower basis deserves the whole-hearted support of the trade, for it is only by bringing these down to a minimum that the consuming trades can be permanently encouraged to increase and develop along the most favourable lines. One brighter spot is the somewhat improved condition of affairs in the United States. The general depression of the rubber market has been in no small part the direct result of troubles in the United States manufacturing centres, notably in Akron, in Ohio, the largest rubber-consuming area of North America. In this city things are now running quite smoothly again, and those on the spot look for a steady extension in manufacturing operations there, though no doubt allowance must be made for the apparently reactionary state of general trade across the Atlantic. This is, of course, bound to hit the rubber market, and bring about a temporary restriction in the uses of the commodity. A point which is bound sooner or later to have an effect upon the demand for rubber is the increasing demand met with for the employment of a greater percentage of rubber than hitherto in so-called rubber articles. The use of substitutes of all sorts in rubber manufacturing operations was fostered to an enormous extent by the excessively high prices ruling some time ago, and the trade is only just righting itself from this condition of affairs. At anything below 3s. a lb. it is certain that manufacturers will put increased quantities of rubber into their goods, and in this direction the probabilities are in favour of a very considerable increase in consumption apart altogether from the opening up of entirely new uses.

Canadian Electrical Trade.

British electrical manufacturing cannot fail to gain from the close investigation that the Canadian market has been receiving from the minds of experienced and up-to-date authorities. We have no need of reports to impress us with the vastness of the country and its resources, or to tell us what should follow the great inrush of population that we have witnessed in recent years. But we do need advice from men on this side, who, knowing thoroughly the conditions here from the manufacturing standpoint, and being possessed with a passion for trade expansion, are able to spare the time to consider the problems of the position in the very centres where those problems are created. When Mr. Hamilton Wickes, His Majesty's Trade Commissioner for Canada, was collecting his material on the position, he entered in great detail into the organisation and influence of the National Board of Fire Underwriters of the United States, and made recommendations which need not be repeated here—they are so well known to everybody who is interested in the Canadian and American position. Other writers approach the matter from a different and perhaps, to some extent, specialised electrical standpoint, and we welcome all opinions, for it is only by the most complete study of the position from every point of view that the most satisfactory results will be secured for the future—and it is the future, perhaps, more than the immediate present, that is of importance to us in Canada. This week we with pleasure throw open our columns to a valuable communication from Mr. Herbert Berry, in which he exposes, we think very effectively, some of the weak places of the Underwriters' armour. He does not so much concern himself in this letter with the questions of how to adapt ourselves to the conditions resulting from the Underwriters' control. He is more concerned to show that the Underwriters' Code is itself in need of amendment in the interests of efficiency and safety. In the United Kingdom we count human life as sacred, but in Canada and America the said Code, while it pays some heed to fire risks, appears not to recognise the life hazard. Without entering further into the question now, we would commend Mr. Berry's communication, written from a mind deeply impressed by things seen on his recent visit across the Atlantic, to the serious attention of all interested in the subject, and we invite contributions thereon, critical or otherwise, from others of our readers.

THE ELECTRICAL EXHIBITS AT THE OLYMPIA MOTOR-CAR EXHIBITION.

By CHAS. J. WEBB, A.I.A.E.

The general consensus of opinion is that, were it not for the developments in an electrical direction, there would be little or no novelty at the 1913 Motor-Car Exhibition which opened at Olympia, London, W., on Friday last week! Not only is one glad to see the re-appearance of the electromobile—although, it is true, there is only a solitary example, an Arrol-Johnston coupé fitted with Edison battery—but on one car—an American, by the way—there is an electrically-controlled change speed gear, which, by many people, is regarded as the forerunner of another coming great change in petrol motor-car design. A year ago, when reviewing the 1912 Exhibition, I had occasion to point out that one of the principal features of the Show was the rapid development that had taken place with regard to the adoption of electricity as the medium for lighting the lamps in and about motor-cars. Being compelled for want of time, and also space, to withhold any lengthy remarks on this part of the display until next week, it must suffice, for the meantime, to mention that the tendency in favour of electric illumination on motor-vehicles has become even more accentuated.

Apart from lighting, the great outstanding feature of the current Exhibition is the large number of electrical devices that have been brought out to dispense with the old and crude methods of starting up the engines of petrol cars by means of a handle at the front of the vehicle. This is a departure, the lead in which has been taken by American motor and electrical engineers, who, encouraged by the motoring public on the other side of the Atlantic, have been producing electrical engine starting devices for two or three years past. As a matter of fact, there were a few examples of such arrangements to be seen at Olympia a year ago, but they then aroused but a relatively small interest. In the 12 months that have since elapsed, it is, however, apparent that both British motor engineers and British motorists have begun to take a keener interest in the question of electric starters, with the result that, as already mentioned, they this year form the great feature of the Exhibition, being shown as a standard part of the equipment of about 15 different makes of cars, and offered, as an extra, by most manufacturers, should purchasers of their vehicles desire the same.

Electricity is, of course, not the only means by which engines can be started; there have been various other systems introduced, some of a mechanical nature, using racks and wound-up springs, and yet others employing compressed air and acetylene. Judging from present indications, however, it would seem that electricity is becoming, if it has not already become, the most favoured method, and, of course, it is the only one with which I propose to deal in the columns of the Review. The moment one commences to inquire into the subject, however, so it is found that considerable difference of opinion exists, even among electrical engineers, as to the best means of solving the problem. Where an electric motor is used to start an engine, a source of energy is, of course, necessary, this premising the installation of a battery of accumulators; a second premise is that the frequent charging of the battery from a public or private electricity supply main being practically out of the question, a dynamo driven in some way by the engine must be installed on the car. Seeing that on most modern cars a dynamo and battery are already provided in connection with the lighting system, the problem of supplying current for engine-starting purposes has presented no great difficulty. It is here, however, that the first difference of opinion, and practice, has arisen.

Although there is no controversy regarding the desirability of electric lighting and engine-starting systems on petrol cars, opinion, even in electrical circles, is more or less divided as to whether the generator and motor should be combined in a single device, or whether it is better to separate them into distinct units, which are, in so far as is possible, independent of each other. There is much to be said for and against both methods. In addition to being reliable and of minimum weight, it goes without saying that

any such system, whether it be of the combined unit or separate unit type, must be as simple as possible, and, above all, accessible, for none can be expected to run indefinitely without attention and reasonable care. So far as the efficiency of the two systems is concerned, there is no reason why this should not be just as high in the one as in the other, while, again, as regards the question of weight, there is little or no difference between the two arrangements. The combined unit method has the advantage that the generator and motor form a single compact device, which may perhaps be more easily located under the engine bonnet, and with probably less wiring than its rival. On the other hand, the separate unit system has the advantage that each part is smaller and lighter than the combined apparatus.

To ensure efficient regulation, the dynamo must be, generally speaking, of the shunt-wound type, for supplying the lighting current and charging the battery, while the engine starting motor must be of the series-wound variety, in order to provide a heavy starting torque at low speeds, as well as a power output that increases more rapidly than the demand for current, this being essential to safeguard the battery. Where the system is in the form of a generator-motor, it is consequently necessary to employ two different types of winding on the same machine. Furthermore, in the combined unit system the generator-motor is always running when the engine of the car is in operation—although provision is made in some cases for throwing out the dynamo driving gear when the battery is fully charged. The separate unit advocates argue that these are drawbacks, and point out that in their method the motor is only in operation when it is desired to start up an engine. One could go on giving arguments pro and con for each of the respective systems. Thus the separate unit advocates claim that the dynamo and the motor can be disposed on the chassis to the best advantage. The rim of the fly-wheel is, in the majority of cases, regarded as the best position to apply the starting effort. On the other hand, this is not the best position for the driving of the generator, as it gives too high a speed. Whatever the outcome of the matter will be, as a result of practical experience, it may be stated that at the present time, while there are several very successful systems of combined dynamos and motors, the majority of the systems in use employ a separate machine for generating current and for starting the engine, and it is on this account that in briefly dealing with the features of the different systems, I have first taken what may be termed the separate unit section.

At this point it may be mentioned that the writer's object has been to give a general *résumé* of the various electrical methods employed for the starting of the engines of petrol cars, as revealed at Olympia. No attempt has been made to mention every system in detail, nor to point out at any great length the features of construction of each particular system. Nothing short of a volume would suffice to cover every one of the many devices which have been introduced, and, in the present state of development, such a volume would only be valuable as indicating the great variety of methods employed, and the wide variation of standards adopted for certain essentials. The experimental work and practical knowledge gained during the next 12 months will undoubtedly do more than all the theorising that could possibly be done regarding this interesting problem. Indeed, a new field of work for the engine-testing shops and motor-car factories is opened up by the advent of the electric starter, for at present there seems to be no definite information available as to the speed which must be imparted to an engine in order to start it up, or as to the amount of power necessary to impart that speed to it; these points have an important bearing on the power and size of the electric motor and the ratios of the gearing between it and the engine. Little, if any, experimental work has been carried out in this direction, the brute strength of man having hitherto been depended upon for the starting of motor-car engines. The speed at which an engine will start to take up its own cycle of operations is a function of the carburation and the ignition, and it is in this direction that experiments will have to be carried out. On other points, too, there is a wide variety of opinion as to the best methods to adopt, such as, for example, the necessary voltage—the systems in use varying from 6 to 24 volts—and also whether the wiring should be on the single-wire system with "earthed" return, or double-wire plan. Again, no uniformity exists as regards the transmission of the power of the starting motor, although the plan of causing a pinion on the armature spindle to slide laterally into mesh with a toothed ring formed on, or secured to, the periphery of the engine fly-wheel predominates. Thus it will be seen that there is a variety of problems which will only be solved by the results obtained in careful tests and actual use, for it must be remembered that not all drivers—paid or amateur—are electrical engineers, and it is on the behaviour of the different systems in their hands that the success or otherwise of the different installations largely depends.

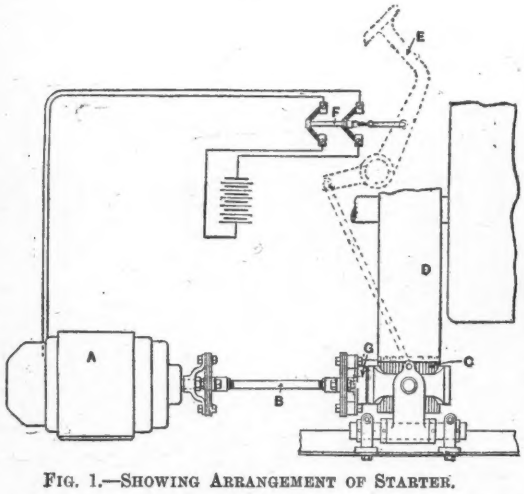

Fig. 1.—Showing Arrangement of Starter.

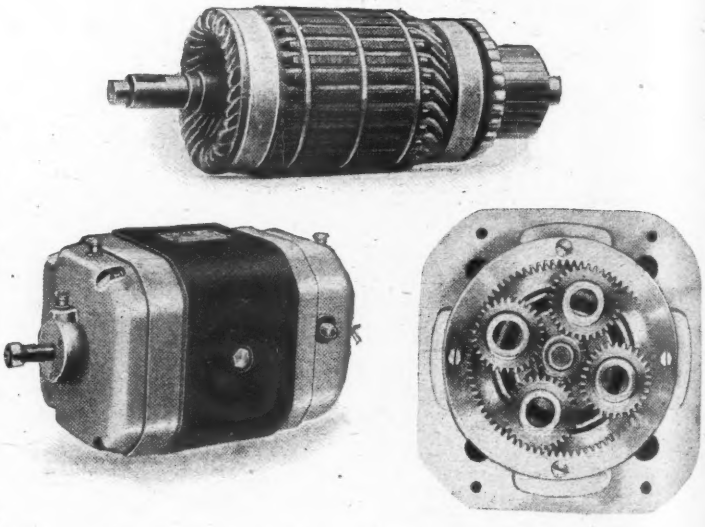

Fig. 2.—Armature, Geared Motor, and Reduction Gear.

The C.A.V. Electric Engine Starter.

Separate Unit Starters.

The C.A.V.—Among the new starters, probably the one that is engaging most attention, is that which has been brought out by Messrs. C. A. Vandervell & Co., of Acton Vale, W., whose lighting dynamos have met with considerable success in the motor world. The starter is separate from the dynamo; the motor is series-wound, and is provided with an enclosed reduction gear, enabling the employment of a high-speed machine, capable of developing a powerful starting torque, the momentary discharge of current being at the same time kept well within the safe limits of the battery. A diagram of the connections is given in fig. 1. As will be seen, the motor A drives, by means of a shaft B fitted with two leather flexible joints, a friction roller C, which is pulled into

engagement with the fly-wheel D of the engine, when the pedal E is depressed. As illustrated, the further depression of this pedal closes a double-pole switch F, connecting up the battery to the motor, but, in practice, Messrs. Vandervell are now separating these two operations, a separate pedal being provided to switch on the current as soon as the friction roller is in contact with the fly-wheel. A free-wheel clutch at G allows the engine to overrun the motor directly it starts up, so that no harm is done to the motor before the current is switched off and the roller thrown out of contact. The starters are made in two sizes, one for engines up to 20 H.P., and another for those of

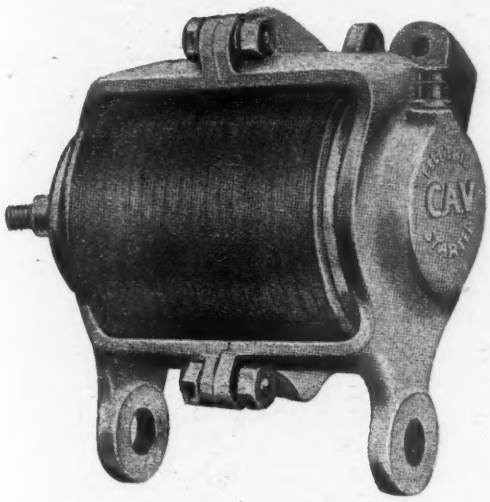

Fig. 3.—Friction Pulley, C.A.V. Starter.

high compression or developing up to 50 H.P. Furthermore, to suit other plans of installation, motors without the enclosed speed reduction gear are also being made. All are claimed to be able to rotate an engine at from 90 to 140 R.P.M., and to be sufficiently powerful to prevent an engine back-firing against them. The C.A.V. system has already been adopted as a standard fitting on one of the new types of Daimler cars, as well as on several other British and foreign vehicles.

(*To be continued.*)

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Travelling Representative.

Your correspondent "Anti-Traveller" in his letter under the above heading, has, I think, put the case from a very narrow point of view. He proclaims himself just the sort of man that a representative engineer would be glad to miss when on his travels. Probably he would deign to glance at the representative's card, and then send out a message to the effect that he is too busy to see anyone—the usual well-worn excuse with men of this limited type.

Reading the letter in question, one would suppose that manufacturers in the bulk are fools to waste their money in paying wages, and sometimes commission, to an army of representatives. Now does "Anti-Traveller" really think that if representatives did not bring business to the manufacturer, he would continue to employ them? If they (the manufacturers) could do as well by advertising and Press notices, then why on earth don't they? "Anti-Traveller" must show them the way to do it; his services would be invaluable, and no doubt he could reckon on a substantial salary, by acting as consulting advertiser to manufacturers. May I suggest to him that it would be profitable to set up business on this basis, and as I feel sure he has a generous spirit, give employment to the army of representatives whose present jobs he would do away with.

The idea of the principal or managing director of a large manufacturing firm making a round of old customers is distinctly good. The "ordinary" representative, doubtless, would not be granted an interview by "Anti-Traveller," but a principal or director—Ah! well—that is a different matter, eh! No trace of snobbishness here. Does "Anti-Traveller" know that the representative might conceivably know more about the goods he is selling than either the principal or director, although he might not be able to offer such fat cigars, and stand such comfortable lunches!

Another point "Anti-Traveller" misses is personality. I suppose he will agree that there is very little personality about an advertisement or Press description. Now a large proportion of representatives have personality, while some have confounded cheek, and both qualities are useful, in the great art of getting orders.

Regarding the question of cost, it seems fairly obvious that if you do away with the representative, you will have to increase the amount spent on advertising, and although advertisement is good, advertisement plus representation is better.

I cannot agree with "Anti-Traveller" when he states that the "ordinary" traveller "seldom possesses more than a smattering of technical knowledge." Usually the men sent out by a manufacturing firm know what they are talking about, and are fully conversant with the goods they are selling, even if they cannot answer every question which an anti-traveller might put to them.

I have the good fortune to be one of the selling engineers of a well-known British firm, and from my experience can say that a very large number of engineers make it a practice to grant, as far as possible, an interview to any representative calling. They may not always be satisfied with the call, but at least they do stand a chance of having something brought to their notice which had perhaps escaped them when reading the various journals, and consequently have added a little knowledge to their store. Of course the engineer to whom you can tell nothing, and the snob, will always be with us, but thank heaven they are few in number, as they are of very little use to their own employers, and none at all to yours truly—

Representative Engineer.

Noticing the article on this subject in a recent issue, I wish to join issue with several of the author's comments. The custom of sending out travellers is both ancient and modern, but it does not influence the cost of electrical accessories in the direction of higher prices any more at the present than it has in the past; in fact, against the increased cost of labour and material, prices have a tendency to be lower, to the benefit of the consumer and to the popularising of the uses of electrical energy. It is recognised that the technical Press is willing to give descriptions of any useful apparatus (when called upon to favour), but in these stirring times, business astuteness aims to maintain its establishment by offering special lines to prospective purchasers, and giving practical demonstrations without circularising; hence where consulting engineers and contractors do not interest themselves to the extent derived from an energetic representative's call, one feels that consultants and contractors become attached to one firm's goods at a disadvantage to themselves and their consumers. The advantage of the "Travelling Representative" is again apparent.

Time and money spent upon looking up contractors and engineers for the purpose of keeping them reminded of a firm's existence are not wasted, but are serviceable in avoiding, as far as possible, giving bogus prospectors latitude without inquiries being made on the spot. This object cannot be effected by the issue of periodical circulars and the avoidance of "The Travelling Representative."

Probably "Anti-Traveller" is in possession of a sinecure, or may be tied to accept or specify one firm's specialities, and does not desire to be influenced for the better, though the accusation of smattering knowledge generally arises from "Anti-Traveller's" attempt to obtain information without any intention of purchasing an outside firm's goods, to the disadvantage of the introducing representative.

First Office Boy Up.

Pressure Regulation.

I have been following with considerable interest the articles appearing in your columns *re* Pressure Regulation. Some time ago Mr. Turnbull stated in an article that, should the supply of steam be shut off from a self-excited compound-

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wound D.C. turbo-generator, the shunt field would disappear, owing to the current coming back on the generator from parallel machines, causing it to run up as a series motor and attain a dangerous speed.

Part of this statement was queried by Mr. Allingham by saying, how can the shunt field disappear so long as it is connected across the brushes? but he agreed with Mr. Turnbull as regards the machine running as a series motor. I should like to point out that before this is possible, the machine must first reverse in rotation, for should the speed of the generator drop, owing to bad steam, &c., sufficiently to allow it to be motored by the other sets in parallel, the shunt field will be found to be overpowered by the main field long before the speed becomes excessive. As soon as this has been accomplished, the machine will pull up to a standstill, cause a dead short, reverse and then run up as a series motor. Up to the time of reversing it is acting as a compound motor, differentially wound, and not as a series motor until it has reversed in rotation.

Though reverse-current relays are unreliable in operation, they are generally inserted, in order to help to avoid the possibility of this danger; but where an equaliser is employed the machine runs very little risk, as any reverse current will flow through the armature only and not through the main winding.

W. D. Lovell.

Middlesbrough,
November 4th, 1913.

The Value of a Sense of Proportion.

The interesting leading article in the current issue of the Electrical Review on the sense of proportion, might well be taken up by the I.E.E., and copies sent to the principals of various colleges, with a request that they be placed before the senate, who could read, mark, learn and inwardly digest them, especially the last two paragraphs.

However great one's admiration may be for thoroughness, there is no doubt that it can, and has been, overdone in some electricity works, either in the stations, on mains, or in the organisation. Some stations may be said to be in some respects models from an engineering standpoint, but certainly not from a financial point of view.

One has only to compare treatises by British authors with those by American authors, and I think it will be found that the former do not come up to quite the same standard as the latter in their chapters dealing with commercial problems, although I may not have had the pleasure of reading the best of the former up to the present.

Lectures on commercial economics would not only be of great value in themselves, but would stimulate the interest and broaden the outlook of students.

Managers, with all due respect to them, may be classified good, bad and indifferent, with still further subdivisions; and it is quite possible that many a good engineer has not the full confidence of his Committee, because of this lack of business training.

In some few instances it is very probable that quite different financial results would have been obtained if the Committees concerned had had the wisdom and foresight to engage good consultants in the first instance and had retained their services afterwards, in order to preserve uniformity in policy and design; this is sometimes difficult to achieve when there are many changes in the managerial positions. But the question of consulting engineer *versus* manager is rather delicate ground to tread on, and many would, in all probability, prefer to sit on the wall and decide each case on its merits.

W. E. P.

A Call to the Soil.

In the past two or three issues of the Electrical Review there appears an advertisement for 12 youths to learn farming in Australia, which is, to me, very amusing. Is the Review in the future to be converted into a Farming Gazette, or a combination of both electrical engineering and farming?

I hope you won't be offended at this suggestion, Mr. Editor. Although I do not doubt for one moment that it is a genuine advertisement, I am struck with your deep sense of humour in the acceptance and the placing of the same.

Twelve youths will be paid good wages to learn farming, and have board and lodgings found; and directly underneath is another advertisement for a premium pupil for central station work, whose people, methinks, will have to provide his board and lodgings for many a year to come.

The young men who are the successful applicants will in time no doubt consider themselves fortunate that they were not drawn into the tangles of the electrical central-station profession, or escaped from them in time, in which, to use your phraseology, there is absolutely no idea of "The value of the sense of proportion."

Further, we learn that electricity is being applied to agriculture with good results. Now very probably these gentlemen are at present employed in our central or sub-stations at the usual office-boy's wage, therefore I tender them my heartiest congratulations for their far-seeing and prophetic powers, for who dare deny that one day we may hear of such a man as the farm electrician, whose duties may be either to act as shift engineer at the farm power-house or to wire circuits around a gooseberry bush or apple tree?

In conclusion, to the older men in the electrical profession I say "cheer up!" for everything comes to him that knows how to wait. If we, not being youths, are barred from applying for the positions above referred to, we may yet have an opportunity of applying our electrical engineering experience to advantage.

Like Micawber, many of us have for years been waiting for circumstances to change—for something to turn up. Be ye, therefore, ready to harken unto the call of the soil.

A. V. Beuck.

Aberdare, *November 9th*, 1913.

Electric Clocks.

In your issue of to-day, I observe a description of an installation of electric clocks, in which occur the words:—

"Mr. F. Hope-Jones, the inventor of the system."

The original patents of the system in question are Nos. 1,587 of 1895, and 7,868 of 1897, and upon both may be read the names of the joint patentees, Messrs. G. B. Bowell and F. Hope-Jones.

Now that the electric clock industry has become a real feature in the electrical and commercial world, it is of some interest to give "honour where honour is due," to the genuine pioneers and experimentalists to whom the successes of the present day are due.

The commercial sagacity of Mr. Hope-Jones is, I think, universally admitted by those who know him. But, as regards the "invention," it cannot be too widely known that Mr. G. B. Bowell had spent some years previous to 1895 in experimental work—the outcome of which was the first patent No. 1,587 of 1895—and I trust that my natural desire to see that every credit is given him for the years of unsparing labour he has spent upon electric clocks may be accepted as an excuse for this letter.

H. T. W. Bowell.

London, E.C., *November 8th*, 1913.

Canadian Electrical Trade.

I have read a communicated article on the subject of Canadian electrical trade, published in your issue of October 31st, and it interests me to read an expression of opinion on this subject, viewed from a different point.

I have just returned from a journey across the Canadian Continent, and my time has been devoted to a careful study of the existing electrical conditions.

I was fully alive, before I left England, to the powerful control of the electrical trade exercised by the National Board of Fire Underwriters of Chicago and New York, and I was also aware that considerably more than half of the Canadian fire insurance is underwritten in England.

The average British investor is notoriously apathetic, and he is doubtless satisfied that the Canadian fire risk has been reasonably safe-guarded by the Electrical Rules and Regulations issued by the National Board of Underwriters.

It is a significant fact, however, that the insurance premiums in Canada are about 100 per cent. higher than in Great Britain. A comparison of Canadian and European electrical practice throws immediate light on this subject. It does not require a trained electrical expert to find a reason for the high insurance premiums obtaining.

From the fire hazard point of view, the National Electric Code, as at present constituted, provides a safeguard against fire which leaves much to be desired. If we ask ourselves how this is brought about, the answer is not far to seek. The Underwriters' Laboratories are, as far as possible, self-supporting. They are not out for profit-making, but, at the same time, they must live, and they have heavy expenses to meet. How are these expenses met?

By levying a charge upon the manufacturer who pays toll for the inspection and approval of his goods, and a tax for the labels which he attaches to his manufactured articles.

So far, so good, but then let us look a little further into this matter.

There is an adage that the "man who pays the piper calls the tune." Let us take a glance at the names of the various bodies who constitute the Committee of the National Board of Fire Underwriters. They are all American and are as follows:—

American Electric Railway Association.
American Institute of Electrical Engineers.
Associated Factory Mutual Fire Insurance Companies.
National Board of Fire Underwriters.
National Electric Light Association.
National Electrical Contractors' Association.
National Association of Electrical Inspectors.

Is it then surprising that one finds the code bristling with data and dimensions *built up around* the specialities of the American manufacturer? Is it surprising that apparatus which is the outcome of the best British electrical practice is excluded? Personally, I think not. I think it would be strange were it otherwise. Self-preservation is the first law of nature.

The situation is full of anomalies, and we have to ask ourselves "What is the remedy?" The executive of the American National Board of Fire Underwriters have recently extended the hand of good fellowship to the British electrical manufacturers and have invited them, if they are desirous of doing business in the British Dominion of Canada, to realise that their best interests will be served by contributions to their support; in other words, to pay a similar toll for the approval of their goods either in Chicago or through the medium of a London agent. It may be that this proposition has in it the basis of a future agreement, but it is obvious that before such a scheme can be seriously considered by British electrical manufacturers, the National Board of Fire Underwriters must volunteer to "put their house in order."

If the British manufacturer accepts the invitation to co-operate and pay his share to the piper, he must have a proportionate voice in calling the tune.

Any commercial proposition which would not offer proportional representation on the Committee would be an affront to the dignity of the British electrical industry.

In short, Sir, the Electrical Committee of the National Fire Protection Association would require to be widened to include the representatives of interested British electrical associations, and the National Electric Code would require to be redrafted upon impartial lines to suit the best electrical practice for the work under consideration, irrespective of the country of origin.

I enclose herewith copy of a letter which I have addressed to the Canadian *Electrical News*, and which I should like you to insert. It contains the explanation of my previous remark with regard to the serious fire risks obtaining in Canada under the National Electric Code. My letter also deals with a larger and more important subject which is outside the scope of the Board of Underwriters.

I refer to the problem of the life hazard in Canada.

The Canadian Government hold out tempting invitations for the British manufacturer to establish works in Canada, and I am sure there are others, like myself, who are only waiting a favourable opportunity to start works inside the Dominion.

If the Canadian Government will make rules and regulations for the safe-guarding of human life and limb in their Dominion, they will achieve a double purpose; they will materially reduce the loss of life and accident, and, further, they will open up a wide field which will encourage the British electrical manufacturer to build works and open depôts through Canada.

A fair field and no favour is all that the British electrical manufacturer requires.

Herbert H. Berry,
For Berry, Skinner & Co.

London, E.C., *November 11th*, 1913.

(*Copy of Letter to the "Canadian Electrical News."*)

THE ELECTRICAL LIFE HAZARD.

It gives me pleasure to accept an invitation to record a few of the impressions created in my mind during a first and very memorable journey across your vast and progressive Continent.

In doing so, I desire to emphasise the fact that this letter is written by request, not in a critical spirit, but with the sole object of mutually ventilating a subject which is already foremost in the minds of many of your leading engineers.

In order, Sir, not to occupy too much of your valuable space, my remarks must necessarily be of a brief description, and I, therefore, purpose to restrict my comments as far as possible to a superficial comparison of the methods adopted by our respective countries in one particular direction.

I refer to a comparison of the electrical rules and regulations as they exist and the methods of enforcing them, having regard to the safe-guarding of human life.

It will undoubtedly be conceded by every humanitarian that the progress of civilisation must of necessity be retarded if the problem of the life hazard is in any particular direction seriously neglected.

It will also be conceded by every practical engineer that this same problem which makes for civilisation must indissolubly identify itself with the rate of progress of electricity in respect of its widespread and multitudinous industrial application.

With this assumption conceded, it appears that it should be the premier object of the governing body of every community to provide rules and regulations in connection with the uses of electricity to safeguard the public, as far as is reasonably possible, against preventable accidents and loss of life.

The governing body having made such regulations they *must* have the power to enforce them, and to inflict penalities for non-compliance. It is here, Sir, that I find the "Great Divide"—it is here that the ways of the Dominion and the Old Country separate.

I am advised that there are no rules and regulations universally adopted throughout your country, which have primarily been prepared with the sole object to take care of the life hazard. I am advised that with certain local exceptions the National Electric Code of the National Board of Fire Underwriters is generally adopted.

Now, I submit that while admitting the excellent pioneer service of this most respected and valuable Institution, and passing over, at the moment, the admitted technical anomalies the code contains, such an Institution, by reason of its very constitution, *cannot* be a suitable governing body to regulate in its entirety the problem of the life hazard.

The primary object of the underwriters must necessarily be, and should be, to protect the pockets of their shareholders against losses by fire.

Comparisons are oftentimes objectionable, but your country teaches us so many useful lessons that you can afford to believe that, in this case, the comparison is not an invidious one.

In the Old Country the method of procedure is different. Rules and regulations are issued by a governing body, which has the power to enforce them. These rules are widely drawn to embrace the entire life hazard, and are devised to protect "the man in the street" as well as the "employé" in the workshop.

They are entirely independent of any rules and regulations which the Fire Underwriters are free to devise for their own protection against fire.

Great care is exercised that no particular section of the industry is unduly hampered or fostered. The engineer is not the sole arbiter.

Deliberate care is taken to avoid the recommendation of any special type or shape or measurement of apparatus, thus no embargo is placed upon invention.

The degree of safety to be obtained rather than the method of obtaining it, is, and should be, the object of the Regulations.

Every student of thought in your country will agree that it is political suicide to adopt permanently a code which selects for universal use, certain dimensions, "*types*," or "*makes*" of apparatus. It is obvious that such a course is strangling the inventive faculty of the country at its birth, and incidentally playing into the hands of the monopolist. It cannot be argued that the requirements of the National Electric Code are sufficient to prevent loss of life and accident, nor can a code be called consistent which presents in elaborate detail a specification stating that a three-ampere 250-volt switch must have quick make and quick break and a suitable cover, and at the same time allows in the same factory a switch one hundred times larger, *without either* quick make or quick break, and *without* any grounded or protective cover whatever.

Moreover, one is appalled by the number and frequency of accidents, fatal and otherwise, which occur in the workshop and elsewhere. I refer only to those accidents brought to my personal notice during a brief stay in your country. All of these accidents were preventable, and could not have occurred under the normal regulations obtaining in the Old Country. Moreover, I submit, Sir, that it cannot reasonably be argued that the conditions of a new country demand a sacrifice of human life and limb on the grounds of mere "cheapness." This is false sophistry, and not an acceptable theory to the rigid economist. I venture, Sir, in conclusion to put just one case to illustrate the absolute danger of an attempt to standardise too rigidly any particular "speciality."

I submit for discussion that there are at least three important grounds for objection :—

1. A bad electrical practice on technical grounds.
2. A bad business on commercial grounds.
3. A bad fire hazard on both grounds.

(1) *Bad Electrical Practice on Technical Grounds.*—I refer you to page 136 of the 1913 edition of the National Electric Code and to the following statement :—"With link fuse cut-outs there is always the possibility of a larger fuse being put into the cut-out than it was designed for, *which is not true of enclosed fuse cut-outs.*"

This statement being quite incorrect, it is equally misleading. Wherever one goes, the private residence, the workshop, the theatre, the central station, nay, even the Underwriters' Laboratories, one is overwhelmed with samples showing ingenious abuses of this enclosed fuse which (the Code says) cannot be true.

French nails, solid rods, brass tubes, zinc tubes, wires soldered across the old fuse case, wires twisted across the terminal contacts, and for the screw plug, the American penny, the wired cork and the more frequent "nick" with the pocket knife—and yet the Code still says—"It is *not true* that the enclosed fuse cut-out admits *the possibility* of a larger fuse being put into it."

I submit, Sir, that it is never wise to commit to print a statement which cannot be established, and which the Underwriters' engineers themselves do not attempt to defend. It can only serve to discredit in the minds of the uninitiated the other parts of the Code Regulations, many of which are good.

It should be assumed as a basis of reasonable argument that at some time or other in the life of every pair of fuse terminals there will come a moment when, through some reason or other, there is no spare cartridge at hand. Numerous causes may account for this :—(*a*) Demand exceeding supply ; (*b*) shipments lost or late in transit ; (*c*) consumer omits to order spares, &c. ; (*d*) consumer realises that the condition of his electricity supply never warranted the introduction of the extravagant cartridge.

Obviously, the consumer cannot allow his factory to stand still—he must try some temporary expedient, and invariably he *does*.

It is here the code fails conspicuously—it is here the risk of fire is increased, for not only is the *length of air break too short* to give reasonable protection, but the very nature of the terminals are the worst that could possibly be selected for the purpose.

The alternative method, of course, is to provide ample length of break and ample spacing for an open link fuse to break in air, and to provide a proper system of clamping for the fuse link, and finally to make it compulsory that *every fuse*, irrespective of its design, must be enclosed in a suitable cabinet, so that under conditions of normal use or *abuse* there is no danger of the melted fuse coming in contact with any substance which might be ignited thereby. (See Code, page 136.)

The judicious use of cartridge fuses, under these same terminals, must be a question depending upon the conditions and pressure of the electricity supply. It must obviously be a question of education as between the supplier and the consumer. It is very significant when the electrical department of the city of New York consider it necessary to state in the latest edition of their Electrical Code (see page 157) "owing to the difficulty of making proper inspection of the fusing where fuses of the cartridge type are used, it is strongly recommended that this type be not employed where plug or link fuses may be installed."

(2) *A Bad Business on Commercial Grounds.*—I am given to understand that the largest number of enclosed fuses are used on an alternating-current voltage, not exceeding 110 volts. Everyone knows that an alternating current at this voltage presents little fusing difficulty, and to use a cartridge every time a fuse melts is very wasteful. Multiply this proposition by a million consumers, and you have a national economical calamity. It is an undeniable fact that hundreds of thousands of dollars are wasted annually upon the American Continent by the wasteful use of cartridge fuses upon conditions of low voltage where their use is not warranted, and where an open link fuse in a suitable cabinet would provide a lessened fire risk and a great saving in cost of renewals.

I do not wish to be misunderstood on this question. As a manufacturer, I am an interested party, and therefore biased in favour of the cartridge fuse, and I am fully alive to the necessity of its judicious use, particularly upon continuous-current circuits. A properly-designed cartridge fuse is the only fuse I know that can be relied upon to successfully negotiate a "dead short" under the most adverse conditions, but, I say it with deliberation, the case for the cartridge fuse is, in my opinion, being prejudiced and its *abuses* encouraged by "indiscriminate recommendation." It is common knowledge that "over organisation" can become an incubus ; in like manner the ingenious plea of "interchangeability" can be so exaggerated that it becomes a fetish.

(3) *A Bad Fire Hazard on both Grounds.*—It is obvious from the wording that when the Code was first arranged it was either wrongfully or carelessly assumed that a form of cartridge and plug fuse had been invented which "could not be tampered with," and in consequence permission was given for such apparatus to be used without other external protection. Now that it is discovered that such fuses are recklessly abused, not only by the uninitiated, but also by engineers themselves, the whole case for the use of the cartridge fuse without *other protection* fails.

If an N.E.C standard fuse is tampered with and there is no external cover, the risk of fire through melted fuse metal coming in contact with any substance which might be ignited thereby (see Code, page 136) is very great.

I submit, Sir, that here at least is a matter for the urgent and immediate attention of the National Board of Fire Underwriters. They have the advantage to possess a distinguished staff, conspicuous for ability and for courtesy, and fully conscious of anomalies which exist in their code, and anxious to redress any just grievances.

It remains for the electrical trade and the public alike, irrespective of nationality, to assist them to make bold use of the pruning knife, to make the Code consistent and efficient, to model it so that according to the requirements it deals equally and fairly with the *best* accepted electrical practice, not of any one particular country, but of every country irrespective of origin, and to fight courageously at all times the engineered opposition of the monopolist.

HERBERT H. BERRY.

October, 1913.

We were much interested in the article published in your issue of October 31st under the above heading, and we are able to confirm the remarks of your correspondent, who is undoubtedly well informed.

We believe that the British electrical manufacturer is still ignorant of the possibilities of the large business to be obtained in the Canadian market, and if he will study the requirements of the market and make arrangements for the manufacture of various specialities insisted upon by the Canadian buyer, there is a large field open to him.

At the present time the British manufacturer has an advantage, generally speaking, of 10 per cent., and in some cases of 12½ per cent., preference in duty over the American and Continental manufacturer, and the freight rates on electrical goods are the same whether shipment is effected from London, New York or Hamburg.

It may be a surprise to many manufacturers of electrical apparatus in this country to learn that the leading lines of Canadian switches, clusters and other accessories in large demand in Canada, are actually being made in the Birmingham district with the assistance of Continental capital, and that one enterprising electrical firm in this country have thought the prospects of business good enough to induce them to commit themselves to the entire output of Canadian specialities of the factory referred to for some time to come, and their foresight is showing excellent results for themselves.

We have a number of orders on hand at the moment for specialities which we cannot place in this market for the reason that manufacturers whom we have so far approached on the subject quote prices which apparently include the entire cost of the tools necessary to start the business, with the result that we have been compelled to place orders abroad.

With regard to the manufacture of conduit to the "National Code" standard, we think there is a great opportunity awaiting the firm which is the first to lay down plant for the manufacture of the same at competitive prices, and we ourselves are able to order, and have ordered, conduit for the Canadian market in carload lots.

In our opinion, the alleged want of enterprise on the part of many British manufacturers is mainly due to the fact that they are not aware of the opportunities obtaining in Western Canada as compared with Eastern Canada, and representatives sent out from time to time are rarely instructed to go further west than Montreal or Toronto ; and that they believe the difficulties of obtaining a proper show in the East also obtain in the West, where business is more in the hands of buyers who received their early training in the Old Country.

We are looking forward to the time when our clients will be able to obtain the greater part of their electrical machinery and supplies in this country, and when we shall not be compelled to place orders in foreign markets in order to obtain competitive prices.

Chiswell & Co.

London, W.C., *November 7th*, 1913.

No Reflection Intended.

Representations having been made to us by our friends, Messrs. Nalder Bros. & Thompson and Mr. R. W. Paul, that the wording of a recent advertisement of ours in your paper is open to the construction that the goods of other manufacturers are of poor quality; we beg to state that the words used were not intended to convey this meaning, and we should like to express our regret that our advertisement should have been put in a form open to misconception.

Eversheds & Vignoles, Ltd.
E. B. VIGNOLES, *Managing Director.*

Chiswick, W., *November 7th*, 1913.

A prominent advertisement in your issue of October 31st stated:—"No other testing set competes effectively—not only because the work is hopelessly inferior."

There can be no question that this statement is untrue, and is in bad taste. I am further advised that, in view of the recent report in your paper of an abortive action brought against myself by the advertisers, the statement is actionable. The intention of the statement appears to be summed up in the words, "No case, abuse the other side."

The Omega insulation meter is sold on its own merits and by fair methods, in open competition with the testing set referred to in the objectionable advertisement, and even to the "exclusive users" named therein.

I cannot conceive that an advertisement so detrimental to the dignity of your paper, and to that of the electrical trade, appeared with your full knowledge.

R. W. Paul.

New Southgate, N., *November 11th*, 1913.

[As the above letters show, complaints have been made to us by Messrs. Nalder Bros. & Thompson, Ltd., of Queen Street, E.C., and Mr. R. W. Paul, of New Southgate, London, that an advertisement which appeared in one of our recent issues might be construed to cast a slur on the combined ohmmeters and generators manufactured by them respectively under the names of "Ohmer" and "Omega," by a suggestion that they are of inferior workmanship. The advertiser has assured us, as will be seen above, that the advertisement was not intended to convey this impression, and has apologised for the same; and we, on our part, equally regret the form of the advertisement.

It is not within our province to publish editorial comparisons of similar and competing apparatus, and we have consistently refrained from doing so. Therefore we do not regard it as incumbent upon us to enter into any discussion regarding the respective merits of the different apparatus involved in the above correspondence. Nevertheless, the proprietors are fully prepared to express regret that an advertisement which the advertiser responsible admits is open to misconception, should, in the hurry of getting to press with "copy" received at an exceptionally late hour, have escaped the advertisement censor's scrutiny. The practice sometimes adopted by advertisers in our own and other publications of reflecting upon goods supplied by their rivals is, to our minds, both undesirable and unnecessary, and those responsible for the preparation of advertisement "copy" will save trouble and annoyance by avoiding the making of such reflections.—EDS. ELEC. REV.]

Remarkable Motor Records.

Referring to the letter appearing in your issue of the 7th, I see that the first point raised has been answered by the Editors.

As the statement in my letter of October 31st, that the motors were designed to do 120 B.H.P. at 650 R.P.M., appears to have given rise to some misunderstanding, I will endeavour to explain the matter more clearly.

The order for these machines was given and accepted (but not by me) subject to the condition that they were to be capable of running at speeds varying from 228 to 650 R.P.M. The F. L. rating was to be 80 B.H.P. at 650 R.P.M., but they were also to be capable of running at top speed with an overload of 50 per cent. for one hour.

Now with 120 B.H.P., or say, 226 amps., at 650 R.P.M., the strength of field would only be one-third that of the full field at 228 R.P.M, while the armature strength would be enormous in comparison, and I knew very well that if the machines would run under these conditions for one hour, they would run for an indefinite time, as the time would not be limited by heating or sparking; therefore, for the machines to be able to run at all under these conditions, the matter demanding my chief attention was that of armature reaction.

That is why I said I designed them to do 120 B.H.P. at 650 R.P.M.; obviously if they would do that they would be all right for the 80 B.H.P. Of course, they were not correctly rated as 80-B.H.P. motors.

Whatever load the machine will carry at top speed with weakened field, it will carry throughout the entire range, with this difference, that as the bottom speed is approached, and the field becomes stronger, the overload margin becomes greater and greater.

In practice, however, these machines have no heavy work to do at the lower speeds, for although the motor has some 90 tons of rollers to put in motion, owing to the fact that the drive is through the exceedingly clever gearing invented by Mr. G. W. Mascord, only about 50 amperes is required to start up.

Certainly, the final temperature occurs when the rate of heat generation equals the rate of radiation, but the time taken to reach that final temperature will depend upon the nature of the design, and for a machine to reach final temperature in minimum time, it is not necessarily "essentially a copper machine"; on the contrary, such a machine would be badly designed and expensive to build.

In regard to "efficiency," if it is merely a question of some trifling increase in output due to cutting-down of material, then your correspondent's contention as to percentage of losses is correct; but if, on the other hand, owing to certain constructional differences, it should really be a matter of increase in output to the extent of three times that obtainable from an ordinary type machine of the same weight and speed, then I think even he will be able to see and ready to admit that, assuming no unreasonable departure in the way of current and flux densities, the ratio of waste to useful output may be materially affected by the fact that we have only to deal with about one-third the quantity of active material.

The same argument also bears in a measure upon the question of cost per H.P. or KW. of output.

I think your correspondent has made his position perfectly clear, and although at the present moment it may not suit me to give him all the information he may desire to have, I can assure him that no statements have been made in the article of October 10th, or in the letter of October 31st and this present communication, that cannot be fully substantiated; and if he is at any time coming to London, I shall be very pleased to meet him, and will undertake to dispel all his doubts, and think I can promise to give him an opportunity of seeing these machines in operation.

H. Chitty.

London, N., *November 11th*, 1913.

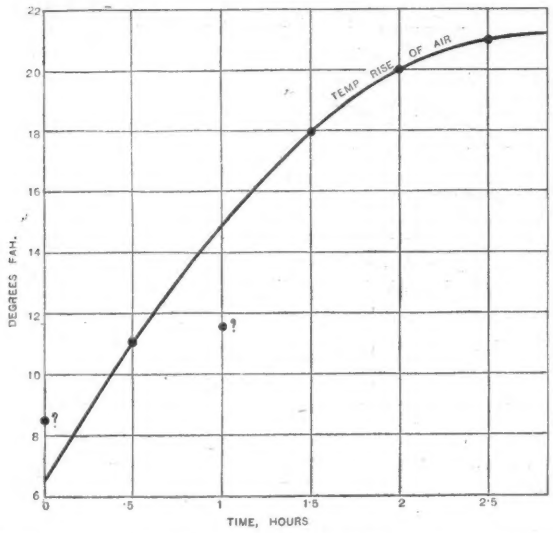
Some Industrial Uses for Electric Fans.—When first introduced, small electric fans were mainly used for creating a cool current of air in confined rooms and areas. In recent years, however, a new field of usefulness seems to have been discovered for the hand appliance. They are now being employed by chocolate sweetmeat makers in dealing with urgent orders. As soon as the chocolates and bon bons are dipped they are placed on long trays in front of a row of fans, which render the confections ready for packing in a fraction of the ordinary time required. Electric fans are also being largely used for the rapid drying of photographic prints. Nowadays press photography has to be carried on with such celerity that the time available for drying purposes has to be cut down to a minimum, a result which is served by the use of the fans. In the bottling department at the works of the Lash Bitters Co., in New York, a room is equipped with long stout tables on which are ranged in open rows a multitude of bottles, each displaying a fresh and, as yet, moist label. Maintaining a vigorous circulation of air, a number of fans hum merrily away on neighbouring brackets and dry the labels in a very short space of time, the installation having proved extremely satisfactory.

REMARKABLE MOTOR RECORDS.

We have received the following particulars on this subject from the designer of the motors (see Electrical Review, October 10th, page 564):—

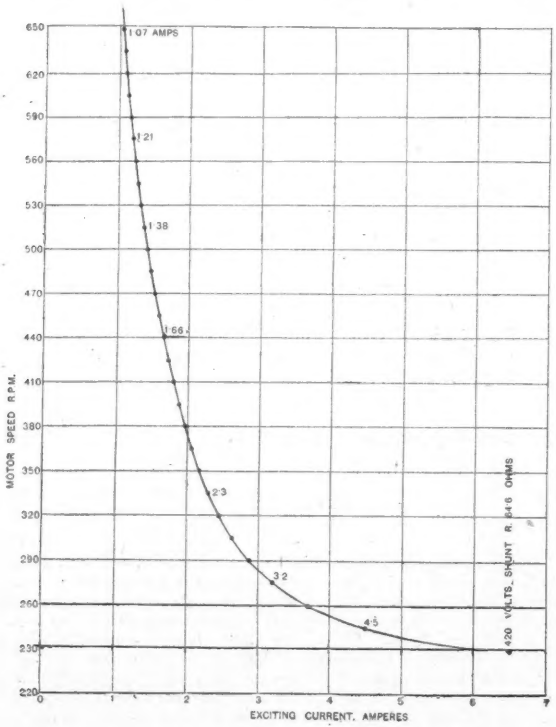
As desired, I now give records of shop tests with one of the motors referred to in the notice of October 10th.

The first part of the run was made approximately under the F.L. rating conditions, *i.e.*, 80 B.H.P. at 650 R.P.M. Throughout this part of the test, half-hourly readings were taken showing temperature of air escaping from the machine, also shop temperatures, columns A and B.



Temperature Tests on Motor for "United Newspapers," Ltd.

There was evidently some inaccuracy in the readings taken for the shop temperatures; the first reading should probably be 76°, instead of 74°, and the third reading 72·5°, instead of 76°. This will be at once apparent from the curve showing the rise of temperature (from column C) of the air escaping from the machine.



Speed and Excitation Curve.

When the temperature of the escaping air becomes constant, the machine will have reached its maximum temperature; in this instance, this was clearly the case in from 2½ to 3 hours; accordingly at 4 o'clock the machine was brought to rest and the temperatures were taken. The machine was started up again at 4.30 for a further run under a 50 per cent. overload, and the temperatures were taken after stopping at 7 o'clock.

Thomas Parker, Ltd.

Requirements, six-pole shunt motor				
420 volts.	150 amps.	307 revs.	Thermometer in vent gap of yoke	Date, 5/6/08.
,,	,,	650 ,,	Col. A, Temperature air at M/c	

Time.	Armature. Volts.	Amps.	Rev.	Shunt. Volts.	Amps.	A.	C. Diffce.	B. Temp. air in shops.	Aux. amperes diverted.
1.30	420	145	652	92	1·33	82·5° F.	8·5 (?)	74° F.	36
2.0	420	146	650	91	1·32	85	11°	74	37
2.30	420	150	651	92	1·26	87·5	11·5 (?)	76 (?)	40
3.0	420	150	650	92	1·25	88	18°	70	40
3.30	420	150	652	91·5	1·24	89	20°	69	41
4.0	420	150	650	88	1·2	89	21°	68	40
						Temperatures.			Rise.
						Armature F.		106° F.	38° F.
						Armature B.		99° F.	31° F.
						Com.		124° F.	56° F.
						Aux.		98° F.	30° F.
						Air in shops		68° F.	a Div.
4.55	423	218	655	87	1·2				58·5
5.10	419	228	660	85	1·19				60
			All these readings taken with ⅜ in. F wd.						lead.

Time.	Armature. Volts.	Amps.	Rev.	Shunt. Volts.	Amps.	Res. in.		Aux. amps. diverv'd
5.25	420	226	654	86	1·19	72·3	⅜ in. F. lead.	60
5.40	420	226	655	86	1·19	72·3		60
6.0	420	226	655	86	1·19	72·3		60
6.30	420	226	656	86	Temperatures after 2½ hours' full load and 2 hours 50 per cent. overload.			60
7.0	420	226	655	86	Armature, 143° F. rise 75°			
					,, 138° B ,, 76°			
					Comm. 145° ,, 77°			
					Aux. 126° ,, 58°			
					Air in shops 68°			

Time.	Armature. Volts.	Amps.	Rev.	Shunt. Volts.	Amps.	Res. in		Aux. amps. diverv'd
	420	?	310	266	3·42		Date 12/6/08.	
	420	240	307	This load thrown on suddenly.				
1.45	418	240	650	92	1·23			58
2.15	420	240	650	92	1·23			59
2.45	420	239	650	91	1·22			60
3.15	412	240	652	86	1·18			62
3.45	408	240	651	86	1·18			63
	Temperatures after 2 hours.							
	Armature front 131° F., rise 61° F.							
	,, Back 136° F. ,, 66° F.							
	Auxiliary 150° F., ,, 80° F.							
	Comm. 144° F., ,, 74° F.							
	Air in shops 70° F.							

I think there would have been very little increase beyond the temperatures recorded, even if the run had been continued, but nothing further was required by the engineer for whose satisfaction the tests were made.

A further two hours' test was made on this machine with a still heavier load. The load of 240 amperes was thrown on suddenly, without any effect whatever. It should be remembered that this run was made with the field reduced to less than one-third its strength at 230 R.P.M., because the difference in the C.E.M.F. must be taken into account as well as the difference in speed.

Probably the speed curve got out for the design of the controller for the shunt winding may be found interesting.

H. Chitty.

Agricultural Research.—Important extensions are being made in the Agriculture Department of Leeds University, and Prof. Priestley, financially assisted by the Board of Agriculture, is engaged upon experiments in the application of electricity to crop production, with a view to ascertaining whether the discharge of electricity under carefully controlled conditions can really produce sufficient increase in the yield of a crop to make it suitable for extended application.

STEAM BOILER WORKING IN ELECTRICAL POWER STATIONS.

By J. W. JACKSON, A.M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers, *at Newcastle, November 10th*, 1913.)

An important consideration in the case of boilers for central power stations is the liveliness of the boiler for dealing with variations in the load. The result of this is that the water-tube boiler has been adopted almost universally; at least eight of the leading makes of water-tube boilers will permit of steam being raised from cold water to the full working pressure in about 30 minutes, whereas with the big cylindrical type of boiler several hours are required for this purpose.

In a previous paper* the author advocated the vertical or only slightly inclined straight tube. Nothing has happened since that time to alter this view. In designing boilers to fulfil this condition of straight vertical tubes, some difficulty is experienced in designing the drums so as to accommodate the requisite number of tubes without at the same time having to press the drum ends or sides into bad shapes. Where the metal is at all strained in obtaining these deep seatings or facings, an irregular stress is permanently put upon the metal, with the result that irregularity of expansion causes local working, and ultimately fracturing of the metal at these positions.

In connection with the design of superheaters, modern competition appears to have called for a superheater of smaller area but placed in a much hotter portion of the boiler, with the natural

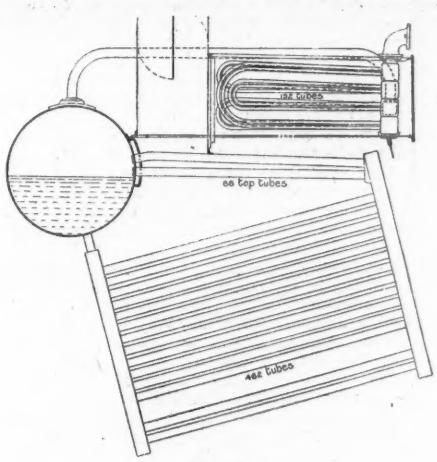


Fig. 1.

result that the superheater tubes are overheated, and will therefore have only a short life. In addition to this, difficulty is experienced in keeping the tubes in position. This is undoubtedly a mistake. Superheaters which were designed 10 years ago with ample surface were fixed much further from the furnace (fig. 1), with the result

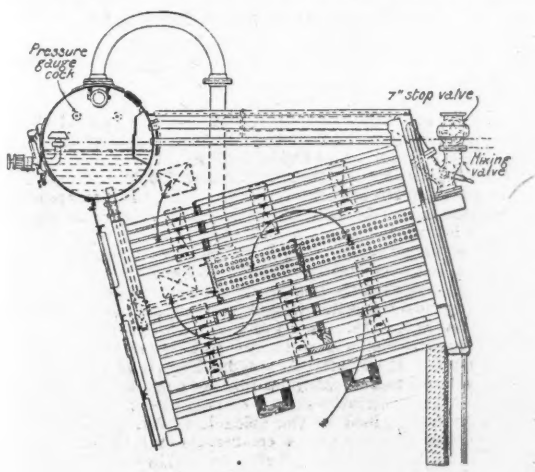


Fig. 2.

that they are much steadier to work and of almost everlasting wear. They also have the advantage that the amount of superheat can be reduced without overheating the tubes.

The more modern superheater (fig. 2) does not usually vary the path of the gases, but shunts more of the saturated steam past the superheater. A smaller quantity of steam passing through the superheater, less heat is transmitted to the steam, thereby allowing the superheater-tube temperature to rise so high that corrosion or oxidisation occurs inside and outside the tube.

The new superheater can be made considerably cheaper, but the difficulties in operation are increased as regards maintenance, reliability and control. The scheme usually means that the modern superheater is fixed between the main water tubes of the boiler, with the result that "sooting" of the tubes becomes a difficult matter; when portions of the path of the gases become clogged with soot, the gases are then concentrated on the narrow passages, with the result that a greater amount of heat is brought to bear on those portions, which causes more rapid oxidisation of the metal, and so shortens its life. This clogging of the gas passages continues until the amount of superheat falls to a comparatively low figure. This trouble is one that requires most careful consideration when the lower grades of fuel are handled, such as duff coal, &c.

The more generous superheater fixed beyond the first bank of tubes being of ample size for its work, because of the lower temperature of the gases, is much less sensitive to the fouling of the passages by soot. We are undoubtedly at the beginning of the period when really high superheated steam is coming into use, and steam temperatures of from 700° F. to possibly 900° F. at the turbine stop valves are likely to be required before very long. Under these conditions it will be seen that if the superheater of the future is fitted in such a hot position of the boiler as in the case of some existing superheaters, troubles will increase. If a superheater tube is bent so that it cannot drain itself at the bottom, serious corrosion or possibly complete clogging of the tube is liable to occur; but even this trouble can be lessened if the superheater is kept well up in the boiler so that it does not normally become flooded when the boiler is at rest. Here again, fig. 1 offers a good solution, as owing to the gas by-passing the superheater there is no danger of the latter being flooded or of its being overheated when starting the boiler. Fig. 3 is a good design when kept well up

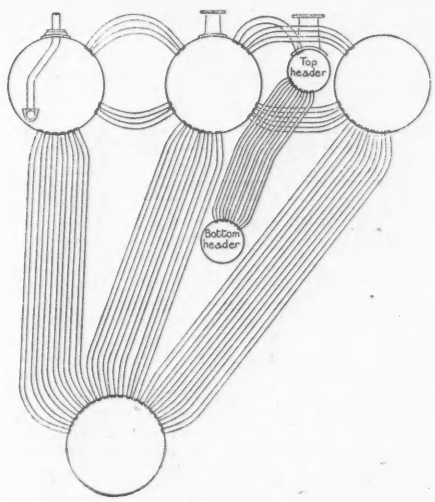


Fig. 3.

above the water level. There is always a considerable amount of risk with a superheater that has to be blown out before the boiler can be put on load, and from this point of view alone it is advisable to stipulate that the superheaters be kept well up above the boiler water-line and also that the superheater be considered, so far as operation is concerned, a portion of the main steam pipe—that is to say, that the boiler should not be fitted for the main steam with a main saturated steam pipe arrangement.

Another trouble with the modern superheater is that owing to its comparatively small surface a considerable drop in pressure takes place when the boiler is being worked at its normal full load, this drop amounting to as much as 10 to 15 lb. per sq. in. at the normal full-load rate of working, whereas with the older superheater a drop of about 5 to 7 lb. takes place. The difficulty of overhauling and cleaning the exterior of the modern superheater is also considerable, this being due to the narrow space provided, it being almost impossible for a man to get into the space and carry out the necessary work. The older superheater being fixed at the top of the boiler allows of the superheater casing being dismantled entirely, so giving very thorough and complete access.

If the drums are placed parallel to the path of the gases, then the front of the drum should be set at a higher level than the back of the drum, while if the drums are at right angles to the flow of the gases the front drum should be elevated and the back drum lowered in comparison with the level of the centre drum. In actual practice, in the case of a boiler with three drums set at right angles to the flow of the gases, the length of the boiler from the front to the back being about 16 ft., there is a difference in the water levels between the back drum and the front drum of as much as 12 in. when the boiler is being steamed at normal full load. The reason for this is not difficult to see. It will be remembered that nearly 75 per cent. of the total evaporation of the boiler takes place in the front two or three rows of tubes. The bubbles of steam rising up

* Elec. Rev., April 26th, 1912.

the tubes at a fairly high rate displace the water in the tube, and so set up a rapid circulation; moreover, the water in the front drum is quite full of large and small bubbles of steam, which have the effect of lowering the density of the water; and, further, friction is set up in the water-circulating tubes by the water flowing from the front drum to the middle and back drums to repeat again the cycle of circulation. There does not appear to be any disadvantage whatever in elevating the front drum by as great an amount as that indicated. A fairly long water-gauge glass is required to cover fully the variation in water levels; this, however, is an advantage rather than otherwise, and in following this scheme out a lower water level can be maintained with much greater safety than is at present experienced; that is to say, by elevating the front drum the water level throughout all the drums will be the same mean level under working conditions, and by carrying as small a quantity of water in the drums as is reasonably safe, greater freedom from priming, when dirty water is carried, is obtained. This question of priming is of great importance, whether the steam is required for reciprocating engines or turbines, and any scheme that can be put forward for reducing this difficulty must receive attention.

Another difficulty in connection with priming is the corrosion of the steam space of the drums and of the steam and superheater tubes. The steam rising from the water surface heavily charged with moisture comes in contact with the heated surfaces of the upper portion of the drum and steam-connecting and superheater tubes, and is liable to set up very serious corrosion, which in a comparatively short time will completely destroy the tubes. It is quite easy to overcome this trouble, so far as the drums are concerned, by painting the internal surfaces of the drums with any of the first-class bitumastic paints that are now on the market. This process of painting with bitumastic paint has now been carried out on boilers for at least five to six years with completely satisfactory results, and if the paint could be easily applied to the surfaces of the cross-over steam and superheater tubes, there is little doubt that the trouble would be got over by the same means. Priming is undoubtedly the real cause of the trouble.

One of the most notable advances made in the present-day steam boiler is that of smokeless working with ordinary bituminous coals, which can be obtained of equal value to the best Welsh steam coal at something like half the cost. In the water-tube boilers built about 15 years ago, the space between the fire grate and the tube surface was extremely small, with the result that the gases were chilled before combustion was completed.

With the modern water-tube boiler a very large combustion space is provided, and a great deal of this combustion space is lined with high-grade firebricks. The firebrick becomes heated up to a fairly high temperature, but being sufficiently far removed from the heart of the flame, it does not suffer at a prohibitive rate, and so allows combustion to be almost completed before the heated gases are allowed to come in contact with the comparatively cold metal surfaces.

Another important reason for the smokelessness of the modern boiler is the mechanical stoker, with which the fuel is gradually heated up at a comparatively slow rate, so that there is no great rush of gas into the furnace at any moment.

Air leakages into the furnace are of very considerable importance, and require the largest amount of attention from the point of view of efficiency. With the induced-draught system, air leakages can occur over very wide areas. In boilers using gas firing, where practically the whole of the furnace brickwork is heated up to almost the same temperature, those places at which air leakage occurs show up as black spaces over the brickwork inside the furnace.

The CO_2 indicator is of great assistance in locating air leakages, but it only indicates that a leakage is taking place. It is of great value, not only to the officials, but also to the firemen. Wages for the firemen are sometimes controlled by the amount of CO_2 indicated by the recorders. This scheme has a great deal in its favour, but it is quite possible to get a very high percentage of CO_2 in a furnace, and so earn a big bonus, without going to great trouble, by allowing a rather large quantity of fuel to go over the back-end unconsumed.

A new page in boiler history was recently opened by Prof. Bone and Dr. Nicholson. The particular line of research adopted by Prof. Bone has been that of surface combustion. The field for this scheme is somewhat limited, the fuel employed being cleaned gas. The great point in its favour is the high thermal efficiency.

Dr. Nicholson's scheme can apparently be applied to any of the usual commercial boilers by rearranging the gas paths. The furnace remains much the same as before, the chief idea being to pass the gases after combustion over the heating surfaces at a very high rate of speed, allowing of a more ready transference of heat. It is also possible to reduce the temperatures of the outlet gases below 200° F., so that the latent heat of the steam contained in the gases is recovered. Of the two schemes, Dr. Nicholson's is the more promising.

The selection of firebricks requires very careful attention. The sulphur and fireclay in coals affect some firebricks very badly.

When difficulty is experienced, experiments must be made with various firebricks until a suitable make is discovered. In some cases natural stone, very high in silica content, taken direct from the stone quarries has been used with very good results.

It will generally be gathered from the above remarks that a good furnace is one that allows plenty of room for combustion and is well lined with a refractory material, as undoubtedly the theory is being more and more appreciated that the boiler has the function of absorbing the heat delivered to it from the furnace, while the function of the furnace is to produce the heat, and the requirements of both must be kept in view if good results are to be obtained.

An important consideration in favour of machine firing is the regularity with which the fuel can be fed into the furnace, and this generally means that a high percentage of CO_2 can be obtained under equal conditions as compared with the hand-firing scheme, the liability to form smoke being at the same time reduced.

It is possible now to handle coal in the finest possible state of division without causing smoke or encountering any other than the usual difficulties; that is to say, that "duff" coal can be as easily handled as "nuts."

Some stokers are much more suitable for certain types of fuel than others. One particular advantage of the chain-grate and step-grate stokers is that they allow of the ash being handled more or less automatically, that is to say, the ash is delivered by the stoker on to or over the dumping bars at the back end of the furnace. Links have recently been developed which allow of a dumping bar being fitted as short as is desirable; the determining factor in this latter case being that a slight check to the ashes, &c., is necessary to allow of complete combustion occurring at the back end, otherwise good fuel may be carried over in fairly considerable quantities.

It is of considerable importance that the ashes should be handled mechanically, as otherwise very high costs of labour and other labour difficulties will occur. This automatic principle is equally necessary for putting the coal into the bunkers. A better scheme than the ash conveyor has been developed, and is now being solely relied upon for some large boiler plants, and it is giving a very considerable amount of satisfaction. The principle, roughly, is that a large cyclone chamber is fitted above an ash bunker; the cyclone chamber is connected up to an exhauster of fairly large capacity which will create a vacuum of as much as 4 in. of mercury. Another pipe is taken from the cyclone chamber and has a number of openings in it, the openings corresponding with the number of ash hoppers under the boilers. An ash crusher is fixed on wheels, and is capable of being moved from one ash hopper to another; it is driven by an electric motor and crushes the ash as the latter is allowed to issue from the boiler ash chute, in which condition it is allowed to fall into the suction pipe. The draught created by the air exhauster at this pipe is so great as to cause the ash and clinker to be drawn up the pipe to a considerable height, where it is ejected through the cyclone chamber into the ash bunker. A very important advantage that this scheme has over any other ash-handling plant is its freedom from dust. The only place where dust can be met with is at the point where the ash is loaded up into the railway trucks from the ash bunker, and even this can be dealt with by fitting spraying pipes inside the ash bunker. In a somewhat similar method, water pressure is used for ejecting the ashes.

Wherever the opportunity presents itself of roughly analysing the solid matter in the boiler water and the amount of hardness of the make-up water, the simple system of treatment, generally with soda ash and lime, should be adopted. Very few boiler compositions can deal with the softening of feed water at anything approaching the cost of the lime and soda system.

Boiler corrosion has always been a most difficult subject, and it is possibly not much nearer being solved now than ever it was. Various electrical schemes are being tried for overcoming the local action on the boiler tubes and plates, by concentrating it on renewable plates located inside the boiler. This promises well, but it must be applied with the utmost care or the troubles may be much increased.

LEGAL.

In re Brecknell, Munro & Rogers, Ltd.

Mr. Justice Sargant on Tuesday, November 11th, in the Chancery Division, heard a petition for the sanction of the Courts to special resolutions passed by this company for the reduction of its capital.

Mr. Arthur Sims, in support of the petition, stated that the company was incorporated in 1904 for the purpose of carrying on business at Bristol as electrical and mechanical engineers. Its nominal capital was £30,000, divided into 2,000 preference shares of £5 each, and 20,000 ordinary shares of £1. It was proposed to reduce that capital by reducing the ordinary shares to 10s. The company had no creditors.

His Lordship asked whether the preference shares were preferential as to capital as well as to dividend.

Counsel said that the preference shares were to be in no way affected by the reduction, though, as a matter of fact, they were preferential as to both. As all the ordinary shares had not been issued, the reduction was really not so large as would appear on the face of it. It was actually a reduction of £7,414 10s., which would be found to be writing off one half of the issued ordinary shares. All the resolutions had been duly passed, and the loss was satisfactorily explained by the affidavit of Mr. Rogers, who had, since the incorporation of the company, been a director, and was also the managing director and chairman. He said that the company had carried on business without writing down its assets or allowing anything for depreciation, and as certain of the company's leases were on the eve of expiring, the board thought the time had now come for putting things in order. Owing to the expiration of the leases, they put the depreciation of the value of the buildings at £1,732 odd, the depreciation on machinery at £4,000, and on loose tools at about £1,400. Nothing had been allowed for depreciation since the incorporation of the company.

There was no opposition, and his Lordship sanctioned the reduction as proposed.

SUNDERLAND DISTRICT ELECTRIC TRAMWAYS, LTD., *v.* NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO. AND THE COUNTY OF DURHAM ELECTRIC POWER SUPPLY CO.

MR. JUSTICE SARGANT, in the Chancery Division, had again before him on Friday, November 7th, the motion by which the plaintiffs in this action sought an interim injunction to restrain the defendants from cutting off the supply of electric power to their tramways.

MR. MARK ROMER, K.C., who, with Mr. Percy Wheeler, appeared for the plaintiffs, said that the matter had stood over from the previous week, an interim injunction already granted being continued over that day to see if some arrangement could not be come to between the parties for a speedy trial. On the previous occasion it had been suggested by Mr. Martelli, K.C., who appeared for the defendants, that the plaintiffs had paid nothing in respect of what was admittedly due. He understood that the defendants had now filed evidence, but he had not yet seen it.

MR. MARTELLI said that they now had evidence that the plaintiffs had paid nothing for their supply of electricity since January last, and they now wanted rather a long time for their pleadings. The defendants were quite willing to continue the supply for a short time if the action could come on for trial at an early date. The result of their filing evidence that nothing had been paid by the plaintiffs since last January was that on the previous night the defendants received by post a cheque for £737. This cheque purported to be in settlement of the defendants' account, and that, of course, could not be right.

MR. JUSTICE SARGANT: Of course you will accept it without prejudice.

MR. MARTELLI said of course that would be so, but he wanted to make it quite clear.

MR. ROMER said that would certainly be right. He had not seen the affidavits that had been filed, but probably there had been some misunderstanding about the matter.

MR. MARTELLI said the supply would be continued, but the defendants were most anxious that this dispute should be settled at an early date, as their case was that there was no agreement whatever between these parties.

His LORDSHIP: You would like to get it disposed of this term?

MR. MARTELLI said yes, but the difficulty was about the statement of claim. Mr. Wheeler wanted three weeks to put it in, but he (Mr. Martelli) suggested that it might be done in a shorter time, and

His LORDSHIP pointed out that he had already had a week, and if he had 10 days more it should be sufficient.

MR. WHEELER agreed to deliver the statement of claim within 10 days.

His LORDSHIP: Then 10 days for the defence?

MR. MARTELLI thought they could do it in a week from receiving the statement of claim.

His LORDSHIP: Very well. Then seven days for the defence; do you want discovery?

MR. MARTELLI thought if the parties exchanged documents it would be sufficient; there were only Acts of Parliament and agreements.

MR. ROMER agreed.

His LORDSHIP: Then there will be an exchange of documents within three days after the delivery of the defence, and I will fix an early day for the trial.

COUNSEL suggested December 9th, and his LORDSHIP said he would take it on that day, subject to anything part heard.

HOBART MANUFACTURING CO. *v.* NEWCOMBE.

AT Devon Assizes at Exeter on November 4th, before Sir Fredk. Low, K.C., M.P., this action was heard.

The PLAINTIFF asked for the return of a mincing machine or its value, £58, and £11 4s. damage for alleged wrongful detention. An electrically-driven mincing machine was fixed in the Plymouth Market to a stall belonging to defendant, a butcher, for exhibition purposes. The company forwarded the defendant a cheque for £2 for the use of the stall, with a request to return the cheque and machine if the arrangement were not satisfactory. Neither the cheque nor machine was returned, the contention of the defence being that the defendant did not require the machine, and could not remove it because he was unable to disconnect the electrical apparatus.

The COMMISSIONER said that the action should have been heard in a County Court. However, he was of opinion that an agreement had been broken by the defendant. He, therefore, ordered the machine to be returned, or its value paid, within seven days, with costs against the defendant on the County Court scale.

German Telephone Prices.—Various firms engaged in the light electrical engineering branches (telephony, telegraphy, &c.) in Germany, recently approached the Imperial Post Office authorities with a view to securing the grant of higher prices in these branches, and it is now stated that the application has been successful in regard to certain post office supplies. The attitude of the postal authorities in the matter is of substantial advantage to the branches concerned, as the former are the most important customers of the latter. As to the price convention which was concluded a short time ago, the interested firms are endeavouring to extend the scope so as to include manufacturers other than those already affected by the convention. The hope is also entertained that it may be possible to apply the system to the export trade.

BUSINESS NOTES.

Notice to our Advertisers. — THE ELECTRICAL REVIEW Advertising Department is seriously inconvenienced at times by the very late arrival of copy for advertisements. In order to avoid disappointment, those who are responsible for preparation of advertising matter are asked to let their desires be known at the earliest possible moment, and to take special note of the fact that *new copy and alterations to existing advertisements (with blocks) should reach the offices, 4, Ludgate Hill, E.C., not later than Monday morning.* Requests to this effect have sometimes been overlooked, but it is imperative that the rule be adhered to in future in order that there may be neither disappointment to the advertiser nor delay in printing the ELECTRICAL REVIEW.

Private Arrangements.—RIDINGS ARC LAMP CO., LTD. Parr Street, Liverpool.—A meeting of the creditors interested in the above matter was held on November 6th, when it was reported that the business was originally started in Manchester, but in 1911 it was taken over by Mr. Atherton, and a company was floated in February, 1911. The capital at that time was £3,000, of which 1,500 shares have been issued, 1,000 £1 shares, and 500 £1 vendors' shares. Debentures have been issued from time to time to the extent of £4,200, on which there is now £179 due in respect of interest. No salary has been drawn by the directors, their services being given absolutely free to the company. Negotiations have been entered into with a view to selling the patent rights and business generally and the majority of the debenture-holders are agreeable to their debentures being transferred. The statement of affairs showed liabilities to sundry creditors of £658, and liability on shares £1,502, while there are debentures for £4,380. The assets are estimated to produce £3,988, there being thus disclosed a deficiency of £2,550 on paper. It was ultimately decided to confirm the liquidation. The following are creditors :—

Bramall, W. H., Manchester	£33
Burman, R. H., Birmingham	96
Cod Arc Lamp Co., Nottingham..	92
Eckstein Heap, Manchester	22
Kelly, Rob & Sons, Liverpool	32
Middleton & Son, Liverpool	41
Royston, E. R., & Co., Liverpool	19
Veritys, Ltd., Manchester..	16
Wittauson & Co., London	43

JOSEPH GREEN & NEPHEW, LTD., Globe Iron Works, Crown Point Road, and Norman Hurst's Garage, Wade Lane, Leeds, automobile, electrical, and general engineers.—A meeting of the creditors interested in the above matter was held at the offices of Messrs. Booth, Wade, Farr & Lomas Walker, solicitors, Central Bank Chambers, Leeds, on Friday, November 7th. The statement of affairs prepared by Messrs. Frederick & C. S. Holliday, incorporated accountants, Greek Street, Leeds, showed unsecured trade liabilities amounting to £961, bank claim £1,159, cash creditors £458, and other liabilities £30, making a total of £2,608. The assets were £2,892. There were preferential claims, including interest on debentures and costs, amounting to £1,381, which reduced the assets to £1,511, and disclosed a deficiency of £1,097. It was explained that the deficiency was accounted for by loss on trading and depreciation as shown in the statement of affairs. The company was formed in April, 1909, with a capital of £4,000 in £1 shares, of which £3,726 were issued. On July 4th last the debenture-holders took possession, and appointed Mr. Fredk. Holliday, Receiver. This was followed by a meeting of the shareholders on October 20th, when Mr. Holliday was selected as liquidator. This appointment was unanimously ratified at the meeting of creditors on the 7th inst., and the estate was left in the hands of the liquidator without a Committee of Inspection.

Trade Announcements.—THE WESTINGHOUSE BRAKE CO., LTD., of King's Cross, London, N., have secured the services of Mr. D. McGregor Stewart, of 166, Buchanan Street, Glasgow, to act as their agent, owing to increased business in Scotland.

MESSRS. WATLINGTON & CO., LTD, announce that increased business has made a second telephone line necessary, and their number has now been altered to City 1257 (two lines).

THE EDISON & SWAN UNITED ELECTRIC LIGHT CO., LTD., Ponder's End, announce that their telephone service has now been supplemented by five lines, and their number is 520 Enfield (six lines).

THE ALTRINCHAM ELECTRIC SUPPLY, LTD., announce that they have transferred the whole of their installation business for wiring and electrical supplies to Mr. E. Wood, hitherto superintendent of the department, who will carry on the business as Messrs. E. Wood and Co., at 29, Stamford New Road, Altrincham.

MR. J. E. BARNES, an engineer of Messrs. L. J. Healing & Co., Ltd., contracting engineers, at Yokohama, Tokyo, &c., is now in this country, and will be pleased to hear (care of the Editors, ELECTRICAL REVIEW) from manufacturers having anything likely to be of interest to the Japanese market.

Electro-Tanning at Burton-on-Trent.—With reference to a proposal for the establishment of a tannery worked on Dr. Groth's system of electric tanning, the Burton-on-Trent Health Committee resolved under date October 28th, "That this Committee will be prepared to recommend the Council to give its consent to the establishment within the borough of the trade in question, subject to a suitable building scheme being submitted, and an approved site chosen."

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Catalogues and Lists.—Messrs. Krupka & Jacoby, Ltd., 26 to 36, Chapter Street, Westminster, London, S.W.—Illustrated lists announcing reduced prices for Osram, Mazda and tantalum lamps.

The Benjamin Electric, Ltd., 117, Victoria Street, Westminster, S.W.—Leaflet No. 52 giving descriptive notes and prices relating to their "Bengrip" adaptors, Benjamin wireless adaptors, and "Benco" lampholders.

Messrs. S. Wolf & Co, Ltd., 115, Southwark Street, London, S.E.—Five pamphlets have been received giving particulars with illustrations and prices of their portable electric tools, as follows:—Air-cooled electric portable drills and reamers with mechanical overload release; electromagnetic chucks and surface plates; electric grinding motors; and electric drilling machines. Dimensions, codewords, and other useful information is included.

Messrs. Meldrums, Ltd., Timperley, near Manchester.—A new catalogue of 12 pages containing a full description, with illustrations, of the "Meldrum" improved forced draught furnace; a circular describing the "Koker" and "Sprinkler" mechanical stokers; also leaflets further relating to these specialities.

Messrs. P. L. Dwyer & Co., 66, Victoria Street, S.W.—Pamphlet dealing the Lighthouse radiator, "Simpla" electric kettle, and steam cooker, for which Messrs. Dwyer are wholesale agents. The price of this apparatus is astonishingly cheap; full particulars as to price, heat loading, spares, &c., are given.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., Blomfield Street, London Wall, London, E.C.—Eight-page price list, giving information descriptive of their solid rubber-sheathed cables for withstanding hard ware and rough usage in mines, docks, &c. Sizes and prices are clearly tabulated for these and also for solid rubber type trailing cables.

Messrs. Veritys, Ltd., 31, King Street, Covent Garden, London, W.C.—Publication No. 736, gives illustrations and detailed prices of a variety of designs of "Aston" radiant lanterns for shop, office, station and street lighting.

Book Notices.—*English and German Technical Terms.*—By J. G. Horner; translated by O. Holtzmann. London: Crosby Lockwood. Price 3s. net.—This is a handy little pocket dictionary of technical terms, compiled by the author for the use of engineers, who nowadays must follow the developments in foreign countries if they wish to keep up to date in their profession. It is neatly got up and printed in clear type. Not being specially designed for the use of electrical engineers, it does not give all the terms which they require; for instance, Bügel is translated as stirrup—in electrical work it has a number of special meanings; Anker is not translated armature; Drehstrom, Kollektor, Bürste, Zähler, Zelle are not mentioned. Nevertheless, it will be found a very useful companion by a large class of engineers.

"Handbook of Technical Instruction for Wireless Telegraphists." By J. C. Hawkhead. 1913. London: Marconi Press Agency, Ltd. Price 3s. 6d. net.

"Lewis's Quarterly List of New Books and New Editions" added to Lewis's Technical and Scientific Circulating Library, 136, Gower Street, W.C.

"Las Funziones Iperbólikas." By A. E. Salazar. Santiago, Chile: University Press. Price 1 zentor.

"*The Laboratory as a Servant of the Engineer.*"—This booklet, issued by the West Ham Testing Laboratory (principal, Mr. G. Lloyd Jones), gives particulars of the procedure followed by the laboratory in testing fuels, and the tests made on engines and boilers, oil, water, cement, &c., with scale of fees charged. Many electricity works are clients of the laboratory.

Dissolutions and Liquidations.—The Sun Power Co. (Eastern Hemisphere), Ltd.—At meetings on September 24th and October 22nd, it was resolved that the company be wound up voluntarily for the purposes of reconstruction, and that Mr. P. S. Fitzer, of Friars House, New Broad Street, E.C., be appointed liquidator.

J. W. Garsden (J. W. Garsden & Co.) electrical engineer, Blackburn.—November 22nd is the last day for receipt of proofs for dividend. Trustee, Mr. J. Smith, 27, Ainsworth Street, Blackburn.

Freeman & Curtis, electric lighting experts, 52, Church Street, Stourbridge.—Messrs. E. Freeman and A. W. Curtis have dissolved partnership. Mr. Freeman will continue the business at the same address as the Stourbridge Electrical Co.

The Nevile Engineering Co., Ltd.—The statutory meeting of the creditors of this company was held on 1st inst. The financial position was fully explained and showed that the tangible assets as stated in the balance-sheet dated June 30th last were as follows:—Freehold land and buildings, £6,664; cash in hand, £6; fixed plant, machinery, tools, patterns, drawings, &c., £3,453; book debts and work in progress, £1,569; stock-in-trade, £2,381 = £14,073. Mr. G. W. Bull, the liquidator, says that the land and buildings have undoubtedly depreciated, and it is feared the assets will not realise anything like the figure stated. The claims of the debenture-holders amount to £9,900, and it is unlikely there will be a surplus available to meet the claims of unsecured creditors. These claims are small, the liability to trade creditors being under £600.

Preston Electric Co., Ltd.—This company is winding up voluntarily, with Mr. T. L. Rawlins, 12, Bennets Hill, Birmingham, as liquidator.

Hydro-Electrical Gear Co., Ltd.—This company is winding up voluntarily with a view to reconstruction. Mr. J. A. Henderson, of 11, Pancras Lane, London, E.C., is liquidator. A meeting of creditors is called for November 20th.

Metalite, Ltd.—A meeting of creditors is called for November 24th, at 9 and 10, Pancras Lane, E.C., by Mr. G. S. Clarke, the liquidator.

Bankruptcy Proceedings.—At the London Bankruptcy Court on Monday, the first meeting of creditors was held under a receiving order made recently against Frederick William Chamier, described as of 59, Fleet Street, E.C. Mr. Daniel Williams, Official Receiver, reported that it appeared from the debtor's statements that he was an Australian, and qualified as a mining and electrical engineer at Frieberg, Saxony. Until 15 months ago he was in the employment of various commercial companies and enterprises in Europe and Asia. He then came to England and became a partner in a business carried on at 59, Fleet Street, E.C., as the British Empire Hygienic Association, the intention being to exploit pharmaceutical products. Having withdrawn from the partnership last June, the debtor had subsequently had the use of an office at the same address. He had asserted that he made at least £100,000 by his earnings and investments, and had lost large sums by speculations and loans. He became interested in the Deutsche Beck Bogenlampen Gesellschaft, of Frankfort-on-Main, an electrical company, of which he ultimately obtained the controlling interest. The company owed him £76,700 in respect of loans, overdrafts, guarantees, &c.; it was now in liquidation, and the debtor was of opinion that when the assets were distributed he would get at least between £10,000 and £12,000. The debtor was the owner of various patents taken out in his own name in Germany in connection with mechanical and electrical appliances, but he placed no present value upon them. A statement of affairs had been submitted, showing the liabilities £511 and assets expected to produce £18,517. The latter consisted of book debts to the face value of over £80,000, and included the before-mentioned debt of £76,700 due from the Frankfort company. The debtor, consequently, did not admit insolvency, but hoped to pay his debts in full, and apply for a rescission of the receiving order, the present position being due to the fact that the assets were not immediately realisable.

Mr. J. F. Spencer Cridland attended for the debtor, and, by general consent, the meeting was adjourned for three weeks, with a view to payment of the debts in full.

William Henry Davis (lately trading as the General Incandescent Fittings Co.), dealer in gas and electric light accessories, Birmingham.—Receiving order made November 4th on debtor's petition. First meeting November 19th; public examination December 4th, at Court House, Birmingham.

Bernard Musgrave, director of a limited company, Howick, Preston.—A supplementary dividend of $\frac{11}{12}$d. in the £, payable November 18th at 19, Exchange Street, Bolton.

We have received the following communication in *re* S. A. M. Rose, in bankruptcy:—"With reference to the notice appearing in the columns of your paper of the 31st ult. regarding the above, my directors wish me to write and say that for some time since Mr. Rose has ceased to be in the employ of the company as technical adviser, or, indeed, to hold any connection with it, other than that of a shareholder. We shall be obliged if you will kindly insert this correction at the earliest opportunity.—The Rose Automatic Target Co., L'd, H. R. Bower, Manager."

Lead.—In their weekly lead report, dated November 8th, Messrs. James Forster & Co. state:—"Production statistics. The increase of 3·5 per cent. mentioned in our last week's circular is the average annual increase for the last 10 years. Closing prices last week were £20 12s. 6d. October, £20 7s. 6d. November, £19 17s. 6d. December, and £19 10s. January. A large business has been done this week for all positions, the buying for November shipment being particularly heavy. Prices have eased off, the demoralisation in other markets having had a sentimental effect on lead, while the arrival of a large quantity at the end of this week and early next will afford a welcome relief to the exceedingly strained position many consumers are now in. We are afraid the relief will be only of a temporary character, as a great deal of the lead coming in will be immediately transshipped to Russian, South American and provincial ports. The demand for export continues, and has resulted in considerable business for shipment up to February. We can only recommend consumers to provide for their requirements in advance for some time to come. October shipment has been done during the week at £20 12s. 6d. to £20 7s. 6d. and £20 10s.; November, £20 5s. to £19 17s. 6d.; December, £19 17s. 6d. to £19 10s.; January, £19 5s. to £18 12s. 6d.; and February, £18 15s. to £18 17s. 6d. Closing prices are:—October, £20 12s. 6d.; November, £19 17s. 6d.; December, £19 10s.; and January, £19 5s. English lead nominal at £21."

Norway.—A company has just been formed at Drammen, for the purpose of building a factory for the manufacturing of rubber cables and electrical insulating materials of all kinds. This is the first manufactory in Norway in this line. The capital of the new company is £2,777. The first works for the manufacture of copper wire was also started at Drammen only a short time ago, and both these works will no doubt be able to cover a good portion of the inland consumption of such materials, which have hitherto been imported, chiefly from Germany.

Canada.—A Canadian paper states that the Canadian General Electric Co., Ltd., have just acquired by purchase all the plant and assets of the Stratford Mill Building Co., at which plant in future will be manufactured not only lines of flour mill machinery heretofore manufactured by the Stratford Mill Building Co., but also the wider range of machinery and equipment as produced by the Allis-Chalmers Co.

For Sale.—By tender (December 9th), electrical power plant and machinery, now at Head Post Office, Cardiff; Controller of Stores, G.P.O., Studd Street Department, London, N. Offers are also invited for purchase of second-hand steam and electrical plant; Leeds Corporation Electric Lighting Department. Particulars are given in our advertisement pages.

Sweden.—A new company, under the name of the Swedish Trading Co., has recently been formed at Stockholm, for the purpose of exporting all kinds of industrial products and manufactures, and for opening up connections between Swedish producers and manufacturers on the one hand and foreign consumers on the other. The new company has a capital of £111,100, and will commence active operations in the course of next year. Simultaneously, another company under the same name at Hong Kong, China, is going to work in connection with the former company for the distribution of Swedish goods in China.

A joint stock concern is about to be started at Arboga, says *Affärsvarlden*, with a capital of 200,000 krona to manufacture corundum, carbide of calcium, and iron alloys by the electric method. The promoters are A. Grönvall, Fars Blume, Lars Svenson, A. Ljungman, P. M. Carlberg and Arvid Johansson, M.E.

LIGHTING and POWER NOTES.

Aboyne.—E.L. Scheme.—At a public meeting held last week it was decided to apply for a prov. order to light the village by electricity, a scheme for which has been submitted by Messrs. T. C. Smith & Co., of Aberdeen.

Aldenham.—Terms having been arranged, the Watford R.D.C. has agreed to support the application of the Watford U.D.C. for powers to supply current within the parish of Aldenham.

Ardsley.—The U.D.C. has decided to invite the Electrical Distribution of Yorkshire, Ltd., to submit a scheme for lighting the town by electricity.

Ballater.—Water Power Scheme.—The T.C. has accepted the offer of Mr. Duncan, of Tillycorthy, through Messrs. T. C. Smith & Co., of Aberdeen, to install electricty in the burgh. The proposed charges are 6d. per unit for private lighting, 4d. for power, and for street lighting; the scheme proposes to utilise water power in the neighbourhood.

Batley. — The Batley Tradesmen's Association has decided to make arrangements for an electric lighting display in the town for a few days preceding Christmas.

Bognor.—Electricity Supply Inaugurated.—This scheme, promoted by the Bognor Gas, Light and Coke Co., and for which Messrs. Handcock & Dykes were the consulting engineers, was formally opened on the 3rd inst., current being switched on to the town by the chairman of the Council. The station plant consists of one 120-B.H.P. Diesel engine, direct coupled to an E.C.C. 30-KW. D.C. generator for 450 to 483 volts, and one 50-B.H.P. Diesel engine direct coupled to a Dick, Kerr 33-KW. D.C. generator, ample space being left for additional sets to be added as required later. The circulating water for the engines is provided by a cooling tower which, with the engine house, is situated in the gas works yard. A balancer booster by the E.C.C., consisting of two balancer motors and two booster dynamos, coupled together and reversible, gives 100 amperes at any voltage from 10 to 80, and the balancers will deal with an out-of-balance current of 48 amperes. The switchboard is by Messrs. Middleton, and consists of nine marble panels; the necessary regulating resistances are fixed below the switchboard. A battery room contains 240 D.P. storage cells, having a capacity of 54 amperes for 10 hours, and capable of supplying the whole of the town when the engines are not running. The underground mains were supplied by Messrs. Siemens Bros. & Co., Ltd., and consist of three-core paper, lead-covered, armoured and jute-covered cables laid direct in the ground; between 7 and 8 miles have been laid. Very neat switch-control pillars have been fixed at various parts of the town, so as to bring the whole of the connections, switches and fusegear above ground, and do away with underground boxes, which are always liable to give trouble in the event of flooding. The system of supply is three-wire at 220 and 440 volts. The number of consumers connected to the mains on the opening day was 70, representing about 4,138 20-watt lamps, and it is anticipated that this number will be considerably increased now that the new station is at work. The price charged for private lighting is 6d. per unit, the maximum allowable under the Order being 8d. We are indebted to Mr. Hammond, the general manager of the company, for these particulars.

Bradford.—The Electricity Committee recently paid a visit of inspection to the electrically-driven weaving shed of Messrs. Emsley, containing 345 looms, and at a luncheon held subsequently, Mr. Thomas Roles, the city electrical engineer, mentioned that the Corporation has received instructions from another firm to electrically equip a similar shed of about the same size. Mr. Emsley, in the course of some remarks, pointed out that though the electricity department paid over £8,000 a year in rates, which was included in the charge for current, yet the Assessment Committee was also rating his motors, as though he had installed a steam plant. Thus he paid rates twice over, and he suggested that this was a matter to be looked into.

Burnham (Somerset).—The U.D.C. has received from the B. of T. consent to the tranfer of the E.L. order to a local company in consideration of the costs incurred being repaid to the Council. The company will supply current for lighting at not more than 6d. per unit for lighting and 3d. for power.

Canada.—The Quebec Development Co., Ltd., incorporated under a Federal charter, with a capital of $2,500,000, has for its objects the acquisition of water rights, the manufacture of electric machinery, the erection of plants and generating stations, and the building of underground subways. The head office is in Montreal, and it is understood that American capital is behind the project.—*Canadian Electrical News.*

Clevedon.—The T.C., on November 5th, adopted a recommendation from the Lighting Committee to the effect that as the Clevedon and District Electric Supply Co., Ltd., had not carried out its agreement with the Council with regard to electric supply in the town, the B. of T. be asked to revoke the prov. order.

Consett (Durham Co.).—Street Lighting.—The Lighting Committee of the U.D.C. has recommended that notice be given to the Shotley Bridge and Consett District Gas Co. to terminate lighting the town on the 18th inst., the Cleveland and Durham Electric Power Co. having undertaken to be in readiness to light the town by that date. The power company is supplying the town with current at 2½d. per unit.

Continental Notes.—Norway.—A company was some time ago formed by three municipalities in the neighbourhood of Notodden, where the large nitrate manufactories are situated, for the purpose of harnessing the Aarlis Waterfalls, which will develop about 12,000 H.P., to be transformed into electrical energy. The work in connection with the erection of the power station has been going on for some time, and will be completed in the course of next year. As the whole amount of power was not required for municipal purposes, it has been decided to hire out the superfluous power, and negotiations have been carried on with a Swiss company, which has made an offer to hire 6,000 H.P. for a manufactory to be erected in the neighbourhood of the town of Porsgrund at the Skiensfjord. These negotiations have now been concluded with the signing of an agreement between the two parties, according to which the Swiss company will take over 6,000 H.P. from the above-mentioned waterfalls, provided that the Government's concession for erecting the works is obtained. The Swiss firm is carrying on a metallurgical business, and the new works in Norway may be regarded as an extension of its present plant.

The Folla River, a tributary of the Surna River in Nordmör, has, it is reported, been purchased with a view to its utilisation as a source of electric power. As there is no convenient lake to collect the water, an artificial basin will be constructed. It is stated that a tunnel nearly two miles long from the artificial basin through the Sandefjeld mountain, would afford some 40,000 to 45,000 H.P., and the reported purchase of marble deposits near the Folla River suggests that the undertaking will be connected with the manufacture of fertilisers from the air.—*Board of Trade Journal.*

Italy.—The Officiri Elettricita Genovesi, a concern in which the A.E.G., of Berlin, and the Bank für Elektrische Unternehmungen, of Zurich, are interested, has secured a concession from the municipal authorities of Genoa for the supply of electrical energy for power purposes in the city until the end of the year 1926. In return for the monopoly certain reductions in the rates charged for public lighting have been agreed to.

Of the 28 big Italian companies engaged in electrical undertakings, only two in 1912 (as compared with three in 1911) paid no dividend, whilst 14 paid the same, nine paid more and three less than last year. The average increase of dividend was from 6·56 to 6·69 per cent. During 1912, 12 companies increased their capital by 30,000,000 lire, whilst the amount of capital invested in new enterprises was 10,000,000 lire. Several important hydro-electrical schemes were sanctioned by the Government during the summer of this year. The sale of electro-mechanical manufactures fell slightly in 1912, and the imports of dynamo-electrical machines and machine parts also suffered, as did the home production of these goods.—*Board of Trade Journal.*

Cornforth.—Street Lighting.—The P.C. has received from the County of Durham Electric P. D. Co., Ltd., an offer to supply electricity for public lighting, with 40 lamps, on a five years' agreement at 30s. per 50-C.P. lamp, from dusk to dawn, and 27s. each from dusk to midnight. The Council has deferred the matter for further consideration.

Dawlish.—Owing to increasing demand for current, the plant at the local E.L. works is to be triplicated.

Elland.—L.G.B. Inquiry.—At an inquiry into the application of the D.C. to borrow £1,550 for the purposes of the electricity undertaking, Mr. H. R. Hooper was informed that there was a deficit of £629 at the beginning of the year. The Council had a powerful gas company to fight, who had a showroom, which the Council had not power to provide for its undertaking.

Finchley.—Loan Sanction.—The L.G.B. has sanctioned the borrowing by the Council of £7,500 for mains, and £6,000 for services.

Flockton.—E.L. Scheme.—The U.D.C. has decided to accept a scheme submitted by the Yorkshire Electric Power Co. for lighting the town by electricity, and to apply to the L.G.B. for sanction to borrow the necessary money. The Ossett Corporation had submitted a scheme previously, but the estimate of the company was much less costly.

Gillingham.—New Loans, &c.—The E.L. Committee has recommended the Council to apply to the L.G.B. for power to borrow £5,000 for mains and services.

The engineer reported that he had inspected the new Diesel engine at the makers' works in Germany, and was informed that the device for enabling the engine to run on gas tar oil could be fitted for less than £100. He estimated that the saving would be about £125 per annum, and recommended that the apparatus be fitted. A motion that the chairman and engineer inspect the Diesel plant at Kingston, which is run on tar oil, and report thereon, was carried.

Glasgow.—Exhibition Results.—The Electrical Exhibition, held under the auspices of the T.C., has had a most successful run. The daily attendance is reported to have averaged about 4,000, and much interest has been evinced in the many-sided exhibits on view. Stand-holders are expressing themselves highly gratified with the results, and local retailers are receiving orders for such articles as radiators, geysers, and the smaller laundry appliances.

Following the example of America, the Electricity Committee has inaugurated on a small scale an experiment in electrically-lighted advertisement hoardings. There is a feeling in the T.C. against the adoption by shop keepers or general advertisers of flashing signs, on the ground that these are apt to frighten restive horses, and add to the dangers of the chief thoroughfares. The suggestion is that if the experiment proves successful, it will be further extended, and bill-posting firms invited to adopt the system, the proposal being to switch on the light after 6 o'clock during winter, when the peak load is off.

Hants.—The C.C., which is establishing a farm school at Old Basing, has decided to utilise electric power for driving the machinery there.

Ilkley.—E.L. Loan.—The D.C. proposes to apply for sanction to borrow £18,000 for its electric lighting scheme.

Kendal.—The T.C. has agreed to supply current to the works of Messrs. Gilkes & Co., engineers, and Messrs. Morphy, Aynam Mills. The latter firm will take 8,000 units per annum for four years, at 1½d. per unit.

Kirkby Lonsdale.—The U.D.C., after discussing an electric light scheme submitted on behalf of a proposed local company, has passed a resolution expressing a friendly attitude to the proposal, but not pledging itself in any way with regard to the method of installation.

Knottingley.—Prov. Order.—The U.D.C. decided at a special meeting on the 6th inst., to apply to the B. of T. for a prov. order for the supply of electricity within the district.

Leeds.—Roundhay E.L. Purchase.—At a meeting of the City Council on Monday, Ald. Wilson again submitted the proposal of the Finance Committee that the Corporation should purchase the undertaking of the Roundhay and District Electric Lighting Co., the Corporation to receive the assets and take over the liabilities as from July 1st, 1914, including £12,390 share capital, together with interest from the date on which the same was raised, and £500 for all the costs of the company incidental to winding up and transfer. After discussion, the resolution was carried by 43 votes to 14.

London.—Islington.—Reserve Fund Investment.—The Finance Committee has had under consideration the report of the district auditor upon the accounts of the borough for the year ended March 31st last. In this report the auditor draws the attention of the Council to the fact that part of the reserve fund of the electricity undertaking is being applied to purposes of a purely capital nature, chiefly an extension of the generating plant, and states that he does not find any statutory authority for the appropriation of this fund for purposes of such a nature. The borough treasurer has informed the Committee that he has consulted the Council's solicitor, who is in agreement with the auditor's views, being of opinion that Sec. 55 of the Electric Lighting Order deals specifically with the application of money carried to a reserve fund, and that the spending of this fund in the purchase of plant is contrary to the terms of the order. Under these circumstances the Committee has decided in future to refrain from applying the reserve fund to purposes which should be met out of capital.

Poplar.—Application is to be made to the L.C.C. for sanction to the borrowing of £2,350, in respect of cable extensions.

Marylebone.—In February, 1912, the Council authorised the supply of current to exhibitions where electrical appliances were shown, at the rate of 1d. per unit, less a rebate of 50 per cent. The Electric Supply Committee now informs the Council that there are certain contractors in the borough who are prepared to make a special display of heating, cooking, &c., apparatus in their showrooms if this rate is granted them, and this has been agreed on. The Committee has also decided to adopt the "telephone" system of tariff for the supply of electricity to the departments of the Council. Based upon last year's accounts, it is expected that the alteration will show a saving of about £150.

Lewisham.—The B. of G. has decided to adopt electricity for wood sawing at the workhouse, in place of hand labour. A 5-H.P. motor is to be hired from the E.L. Co. for the purpose.

Leyton.—The surplus of £3,050 made on the electric lighting undertaking for the last year is to be equally divided between the reserve fund and the ratepayers.

Malvern.—Loan Sanction.—The L.G.B. has sanctioned the borrowing of £2,000 for expenditure on electric mains.

Masham.—The electric lighting question was discussed at a public meeting convened by the U.D.C. last week. The scheme proposed was described by Mr. Best, of Bradford, who said that it was proposed to supply current at 6d. per unit. A resolution was passed requesting the U.D.C. to adopt a friendly attitude towards the scheme, and to offer every facility for carrying it out.

Morden.—Street Lighting.—The Council is considering terms offered by the South Metropolitan Electric Light Co. for lighting a portion of the district by electricity.

Newcastle-under-Lyme.—The T.C. has adopted a recommendation by the Electricity Committee that the scale of charges for current for lighting should be reduced as under:—Shop lighting and other premises (closing at 8 p.m. Saturdays excepted), for any number of lamps burning on one circuit, and using up to 6 amperes, £15 per annum; 8 amperes, £20 per annum; 10 amperes, £25 per annum; theatres and premises keeping open until 11 p.m., for any number of lamps burning on one circuit and using up to 6 amperes, £21 per annum; 8 amperes, £28; 10 amperes, £35. Owing to the hostility of the Gas Committee, the Council rejected a recommendation to canvass a part of the district for electric light consumers.

Newton-in-Makerfield (Lancs.).—Prov. Order.—The U.D.C. has approved of a recommendation of the E.L. Sub-Committee, that application be made to the B. of T. for an E.L. order. The Committee considered an estimate of the cost of a scheme, submitted by Mr. E. M. Lacey, for private lighting consumers and small power users only. As it was thought that the gasworks site might be used for the generating station, Mr. Surtees was instructed to get out alternative costs for gas and steam generating plants at the gasworks capable of developing 220 KW.

Pickering.—Proposed E.L. Scheme.—The U.D.C. after considering an E.L. scheme submitted by Messrs. H. Best and Pullan, has expressed its favourable attitude towards the scheme, but does not pledge itself to adopt it. It is proposed to form a local syndicate to carry out the project and to utilise overhead wires for the supply.

Port Erin (Isle of Man).—The Board of Commissioners has been approached by Messrs. Campbell & Jordan with reference to an E.L. scheme for the town, and offering to provide the generating plant if the authority would undertake the laying of mains, &c. The Board has replied that "the gas company has a monopoly of supply."

Radcliffe (Lancs.).—Proposed Loan.—The D.C. has decided to ask the L.G.B. for permission to borrow £3,950 for extensions.

Rathmines.—New Loans.—The Council has decided to apply for sanction to borrow £11,000 for additional electrical plant, and £1,500 for wiring.

Royton (Lancs.).—The Council has approved the agreement with the Oldham Corporation in regard to the supply of electricity to Royton, and the Royton Council will take steps to get an order.

Sale.—New Plant.—The U.D.C. decided at its last meeting to apply to the L.G.B. for sanction to borrow £1,000 for the provision of a new storage battery and booster at the electricity works.

Shipley.—Plant Extensions.—The U.D.C. has decided to purchase a water-tube boiler, two steam turbines, two 1,000-KW. alternators, two surface condensing plants, and the necessary switchboard and switch gear for the Dockfield Electricity Works. The cost of the new plant is over £10,000. The Council has also resolved to make application to the L.G.B. for powers to borrow £27,000 for extensions at the electricity works in connection with the scheme for providing an alternating-current supply.

Slough.—Football by E.L.—A correspondent informs us that a football match was played at Slough on the evening of November 5th, in aid of charity. The ground was specially lighted by the Slough and Datchet Electric Supply Co., with four 8-ampere Excello arcs, one at each corner, and 10 100-watt Osram, lamps, three on either side, and two at each end of the ground. We understand that the field was splendidly lighted, play being easily followed in any part of the ground, and that over 5,000 spectators were present.

South Africa.—A Large Electrical Winder.—The East Rand Proprietary Mines, Ltd., have placed with Messrs. Fullerton, Hodgart & Barclay, Paisley, an order for a very large electric winder. The plant is to be capable of winding eight tons of ore from a depth of 4,500 ft. at a speed of 3,000 ft. per minute. The winder is arranged for double motor drive on the "Ward-Leonard" system, and will be the largest plant of this type which has been installed in any mine. The conical drums alone will weigh over 200 tons, and the drum shaft, which is in one piece, will weigh over 40 tons.

Sutton (Hull).—Notice has been given to the Hull T.C. of a motion to rescind the recent resolution to apply for a prov. order for electric lighting at Sutton.

Todmorden. — L.G.B. Inquiry.—No opposition was raised at the inquiry, on the 7th inst., relative to the Corporation's application for sanction to borrow, amongst other sums, £5,800, for an extension of the plant at the electricity works. It was explained that the latter had been rendered necessary by the large orders from the cotton manufacturers for increased lighting and power.

Trowbridge.—In view of the local opposition, the U.D.C. has refused the application of the Electric Supply Co. to erect overhead wires in the Bradley Road district.

Tunbridge Wells.—The borough engineer has been instructed to prepare specifications and obtain tenders for wiring the sanatorium buildings. The E.L. Committee has decided to scrap the present day-load set and to install a new 300-kw. steam set, at an estimated cost of £3,500, of which the details are as follows:—Engine, alternator and condensing plant, £2,970; pipework, valves and instruments, £230; foundation, £100; contingencies, £200. After providing for repayment of capital and interest, it is estimated that the proposed new set will reduce the annual working cost of the undertaking by not less than £770.

Venezuela.—One of the features of the electricity supply business in Venezuela appears to be that as soon as one company has established a successful undertaking, another one is organised to compete, though not because of increased demand for current for lighting and power purposes. The result is that a price-cutting war is indulged in, it being a question not of the usual kind, of the survival of the fittest, but which can last the longest financially. This is the state of affairs which, we are informed, has existed for some time in Caracas. We are glad to learn, however, that the opposing parties have been got together, and that there appears a prospect of an early cessation of the price-cutting war. In the same connection, news has just come to hand that in the town of Valencia, where there already exists a company with a plant sufficient to supply the whole demand for electricity supply for many years to come, a syndicate is seeking powers to establish a second plant.

Walsall.—The L.G.B. has given its consent to a loan of £1,840 required by the T.C.

Warminster.—Proposed E.L. Scheme.—The U.D.C. has decided to place no obstacle in the way of the proposal of the Bristol Electric Light Co. to supply the town with electricity.

Watford.—The electrical engineer has been authorised to commence the work of laying mains in connection with Abbotts Langley extension. The 22 houses recently erected by the Council are to be wired for electric light.

Whitworth.—L.G.B. Inquiry.—On Wednesday, last week, an inquiry was held with respect to an application for borrowing powers in connection with the proposed electric lighting of the Whitworth Valley. Mr. H. R. Hooper conducted the inquiry, and Mr. J. C. Owen presented the case for the Council, the only opposition came from the Whitworth Vale Gas Co.

Wisbech.—B. of T. Inquiry.—Mr. A. P. Trotter held an inquiry last week in respect of the site selected by the Wisbech Electric Power and Light Co. for a generating station. Several owners of adjoining property objected on the ground that the noise and vibration would be a nuisance.

Wolverhampton.—Loan Sanction.—The T.C. has received the sanction of the L.G.B. to a loan of £22,000 for electricity purposes.

In the report of the Electricity Committee it is stated that the assessment of the undertaking has been increased from £2,000 to £5,000. The borough accountant and engineer conferred with the valuer to the union, and finally the assessment was agreed at £4,500, which figure the Committee approved.

Wrexham.—Subject to the consent of the B. of T., the T.C. has decided to supply current in bulk to the Wrexham Tenants, Ltd., for homes to be erected at Acton Garden Village, at 3d. per unit net, on a 10 years' agreement, with a minimum annual payment of £100, on condition that all houses erected are wired and fitted up for the electric light.

The B. of T. has granted the Council an order enabling it to supply current to the new miners' rescue station on the border of the town.

York.—In reply to requests for current from residents at Haxby, the T.C. has replied that it is the Council's intention to supply electricity to the district as soon as the necessary powers are obtained.

TRAMWAY and RAILWAY NOTES.

Asiatic Turkey.—A tendency is being shown to improve the methods of communication between the larger cities in Turkey by means of electric tramways, and Aleppo and Jerusalem, in association with the ports of Adana and Jaffa, are at the present moment the subjects of consideration. In this connection the *Bulletin Commercial*, of Brussels, enforces the need to very minutely study local conditions before engaging in tramway construction in any part of Turkey. It should, it says, be noted that the law giving the vilayet authorities power to grant concessions is only of recent date, and it makes no dispositions with regard to older concessions which were hanging fire at Constantinople at the time the law was passed.

Blofield.—The R.D.C. has decided to offer no objection to the proposal of the Norwich Electric Tramways Co., Ltd., to extend the tramway to a point in the village of Thorpe.

Bournemouth.—Tramways Extensions.—The recommendation of the Tramways Committee that powers be sought to extend the tramways in Charminster Road has been confirmed by the T.C., and the latter has decided that the whole question of tramway extension in the borough be taken into consideration.

Canada.—The question of the electrification of the London and Port Stanley Steam Railway was decided on October 22nd in favour of electrification, by the passing of a by-law authorising the expenditure of $700,000 for this purpose.—*Canadian Electrical News.*

Continental Notes.—Switzerland.—The electrification scheme of the Swiss State Railway authorities contemplates the conversion of the St. Gothard railway in the first place, as the production of smoke in the tunnels has long been felt to be a very serious defect. The standing committee of the administrative council of the Federal railways recently had under consideration the question of proceeding with the section of the St. Gothard railway, which connects Erstfeld and Bellinzona, and at the next meeting of the Council a proposal will be made to vote a credit of £1,520,000 for this purpose. It is intended to throw open most of the works to the public competition of private firms, whilst the remainder will be carried out by the State railway department. The reconstruction works, according to a Zurich correspondent of a Cologne newspaper, are of special importance to German industry, inasmuch as the new St. Gothard railway treaty affords to German firms the possibility of competing on the same conditions as Swiss firms for the contracts; on the other hand, the power for the operation of the railway is to be produced in State hydro-electric works, and the Government has already assured itself of various waterfalls for the purpose of the conversion of the railways in general. This decision is said to be based upon the circumstance that in the event of energy being procured from companies, the latter might combine in the form of a trust, and dictate terms to the State, whilst the danger would also exist that the shares of the trust might be acquired by foreign companies, and thus place the railways under the control of external sources.

Germany.—Bavarian State Railways.—According to the *Munch. Neuest. Nachr.*, the Budget allowances for 1914 and 1915 in respect of the electrification of the Bavarian State Railways, will be as follows:—The credit authorised for the lines Salzburg-Berchtesgaden, Garmisch-Mittenwald-Scharnitz, and Garmisch-Griesen, amounts to M. 7,600,000; M. 7,000,000 was apportioned by the 1908-9 Budget; and by the 1912-13 Budget it is intended to defray M. 600,000 of the 1910-11, M. 6,000,000 levy. In the 1912-13 supplementary Budget, M. 527,000 was provided for locomotives on the Garmisch-Griesen line, and M. 1,770,000 for the line equipment and locomotives on the Salzburg-Berchtesgaden route. The total amount provided for rolling stock on these two lines was M. 1,307,000; on the Garmisch-Scharnitz line the driving service and electric loco. equipment is entirely in Austrian hands. Five electric locomotives costing M. 592,000 are required by the traffic on the Garmisch-Griesen line. For the Salzburg-Berchtesgaden route eight hauling locomotives (four each at M. 150,500 and M. 154,700), and four pushing locomotives (two each at M. 112,000 and M. 116,850) are required; the total cost of these is M. 1,768,500. The hauling locomotives for this line are larger, more powerful and built for higher speeds on the level, than are those on the Garmisch-Griesen line, hence the higher cost of the former type. The price differences between the various locomotives for the Salzburg line are due to differences in mechanical design and to differences, made for experimental reasons, in their electrical equipment. The total outlay on the locomotives of both lines, including M. 29,000 for contingencies, is M. 2,300,000, *i.e.*, M. 993,000 in excess of the M. 1,307,000 provided for this purpose. This surplus cannot be made up out of the M. 7,600,000 credit, and must, therefore, be defrayed from the second (M. 6,000,000) levy. The deficiency in the amount provided for the electric locomotives is chiefly attributable to the abnormal increase in total manufacturing costs, which increase was not foreseen even by manufacturers when the 1912-13 Budget was introduced. It was originally expected that the locomotives required could be obtained at a comparatively low price, but subsequently it was found that expenditure in some directions would be 80 per cent. higher than initially estimated.—*E.T.Z.*

According to the *Financial News* the Berlin Metropolitan Railway has placed an initial order for 60 electric locomotives with the Siemens-Schuckert Co., the A.E.G. and the Schwartz Kopf Works.

Glasgow.—Tramways Extensions.—The Tramways Committee is still negotiating with the local authorities and others interested on the routes of the proposed big extensions. So far as can be learned, there are threats of opposition from the railway companies, particularly the Caledonian, while no really definite line of policy appears to have been promulgated by the County Councils involved—those of Lanark, Dumbarton and Renfrewshire. In the case of Dumbarton, there does not, however, appear to be much likelihood of opposition to the extension from Clydebank to Duntocher. The extension from Bank Street, Hillhead, Glasgow, to Byers Road, to which objection was taken by the authorities of the University, and which the route would pass, has also been under consideration, and steps are to be taken to obviate, as far as possible, the risk of danger, through vibration and current, to the more delicate apparatus in the college. The whole scheme of extensions will come before the T.C. shortly for final approval, before the provisional order is actually applied for.

Gosforth-on-Tyne.—The inquest on Robert Walton, the second victim of the tramway accident on the Tyneside Co.'s system on October 18th, was concluded on the 5th inst. The jury returned a verdict that Walton died from the injuries accidentally received in the collision in a dense fog, and it was of the opinion that both cars were being driven at an excessive speed, having regard to the climatic conditions prevailing at the time; the jury also censured Linkhorn, the driver of the break-down wagon.

Greenock.—Tramway Purchase Negatived.—At a meeting of the T.C. on Tuesday, Mr. T. Mitchell handed in a petition, signed by 1,391 ratepayers, approving of the municipalisation of the tramways, and proposed that the Greenock and Port Glasgow Co. be given notice that the T.C. intended exercising its option under Clause 17 of the lease between the town and the company, and terminating the lease at the first break—namely, May 15th, 1914. He contended that £158,000 would be a fair price for the 4½ miles of tramways within the burgh. Mr. Dunn, who seconded, spoke to an interview he had had with Mr. Dalrymple, manager of the Glasgow tramways, who said he was surprised that anyone in Greenock should be against municipalising a concern which had progressed so well during 13½ years. Bailie Brown moved a direct amendment, arguing that if the Corporation waited another 14 years, it would get the tramways at a mere valuation, and not require to pay for them as a going concern. Mr. A. Robertson, who seconded, thought it would be foolish to take over the Greenock portion and leave the company with the Port Glasgow and Gourock sections. Provost McMillan pointed out that the money to buy the tramways would require to be got on loan, and repaid within 30 years, whether earned by the tramways or not. The amendment was adopted.

Leeds.—Proposed Extensions.—The Tramways Committee has decided to apply for powers to extend the tramways to Halton and to the junction of Otley and Shipley Roads, Guiseley, and to construct a system of railless traction from that point to Otley and Burley-in-Wharfedale

Liverpool.—Goods Transport Schemes.—Mr. C. W. Mallins, manager of the Corporation Tramways, has reported on the question of goods transport by means of the city tramways, more particularly with a view to relieving congestion of the dock traffic. As regards the docks-to-station traffic, Mr. Mallins suggests that mechanically-propelled vehicles would largely solve the congestion experienced with horse-drawn vehicles. As regards the transport of goods between the docks and manufacturing centres, in view of the increasingly heavy passenger traffic on the city tramways during the day, the most that could be done would be to run three or four trains per day; and if this were successful a larger scheme could be arranged with the help of the Dock Board and Bootle Corporation, and dependent on the guarantee of at least 1,314,000 tons traffic per year at 2¾d. per ton-mile. The greater scheme suggested includes electrification of the dock railway, or construction of a tramway alongside, with tramway connections to Knotty Ash, joining with the county tramway system, at a cost of £246,750. As an alternative, Mr. Mallins suggests a railless traction scheme at a cost of £40,800.

Oakworth.—At its next meeting, the Keighley T.C. is to be asked to authorise the Tramways Committee to obtain tenders for the overhead electrical equipment and trolley vehicles necessary for installing the Cedes-Stoll system of railless traction on the Oakworth and Eastburn routes.

Oldham.—Car Emergency Appliances.—Arising out of a local tramway fatality and a jury's recommendation that appliances should be carried on cars to enable the rapid release of persons who might be caught underneath, the Tramways Committee on November 6th considered a report of Mr. Dugdale, the general manager, on the subject. This report pointed out that no appliances were carried locally, but a special emergency wagon was kept at Wallshaw depôt. Of 20 authorities communicated with, those at Birkenhead, Blackburn, Blackpool, Halifax, Huddersfield, Hull, Leeds, Nottingham, Preston, Salford, Sunderland and Sheffield adopted a similar system to that at Oldham, the cars not carrying jacks, but emergency wagons being kept. At Birmingham, Bolton, Burnley, Bury, Glasgow, Manchester and Rochdale, jacks were carried on cars, and motormen and conductors were instructed in the use of them. Having heard the report, a resolution was adopted that appliances be procured for all cars in Oldham, and that the men be instructed as to their use.

Oxford.—The Tramway Agreement.—A special meeting of the City Council was held last week to consider the question of the tramways. The General Purposes Committee reported recommending that, instead of adopting the draft agreement submitted by the Tramways Committee, the Council should rely on the existing rights of the Corporation, and that the National Electric Construction Co. be informed of this decision. In the course of a very long discussion, Ald. Brooks moved an amendment to accept the agreement with the company, and asking the latter to notify its acceptance within seven days; this was lost by 27 votes to 25 votes. Mr. Callcutt, seeing that the Council had refused to put the agreement before the company, proposed a further amendment instructing the city solicitor to issue a writ forthwith for the recovery of the liquidated damages. He felt that if they passed the report, they were in exactly the same position as a year ago, and the delay would still go on. Upon a division this amendment was lost by 28 votes to 9, and the report was then carried.

Numerous protests and memorials against the proposal to substitute modern passenger transport for the present out-of-date system have been received from the colleges, &c.

Sheffield.—The Tramways Committee has decided to convey mail bags by tramcar without being accompanied by a Post Office official, at a charge of 2d. per bag per journey for bags not exceeding 28 lb. in weight and 3d. per bag per journey for bags exceeding 28 lb., but not exceeding 56 lb., it being understood that the Corporation does not take or accept any liability in connection with the work.

South Shields.—In our issue of October 31st, we gave some figures relating to the extension of the tramway service from Market Place to Horton Nook. Mr. Robson, the tramways general manager, points out that these referred to the mile of route extension, the 2·38 miles mentioned being the total length of the route which the cars would take.

Tunis.—A tramway system is shortly to be installed in the town of Sfax. The project has just received official approval, and the municipal electricity works will now be handed over to a private company, which, besides improving the lighting of the town, will proceed with the construction and working of the electric tramway system.—*Board of Trade Journal.*

Tyne Tunnel Proposal.—According to the *Newcastle Daily Journal*, a new company has been formed to revive the scheme for connecting North and South Shields by a tunnel and electric railway, and a quarter of a million pounds has been assured.

U.S.A.—Electric Vehicles.—The Electric Light Co., of Hartford, Conn., has not only recently taken up the sale of electric motor vehicles, but has adopted a somewhat novel plan in connection with the same. The vehicles are sold without the usual battery, the Electric Light Co. undertaking for a definite charge to regularly provide the machines with fully-charged batteries.

Wolverhampton.—Six Months' Tramway Results.—The Tramways Committee reports that the receipts for the year ended September 30th were £28,893, as compared with £27,206 in 1912, an increase of £1,687. The assessment of the undertaking has been increased from £2,500 to £5,294.

The Tramways Committee proposes to introduce a motor-'bus service on several routes at an early date.

TELEGRAPH and TELEPHONE NOTES.

Hand-Writing by Wire.—It has just been reported from Stockholm that the Swedish engineer, Widgreen, has invented a new method for the transmission of ordinary hand-writing and of pictures by wire. Patents have been applied for in 15 countries, and the rights have been transferred to a company which was formed recently at Stockholm. It is thought, says our correspondent in Norway, that the invention will become of great commercial value, and that it may effect a considerable reduction in the telegram rates. By means of the new apparatus ordinary hand-writing, as well as ordinary type, may be transmitted directly and reproduced at the receiving station with photographic accuracy. The apparatus can also be employed in connection with telephone wires. It is connected with an ordinary telephone apparatus, which can be used for telegraphic purposes or for telephoning alternatively.

Imperial Wireless Chain.—The Postmaster-General is prepared to consider applications to tender for the construction of the second three high-power wireless stations of the Imperial chain from any wireless company, syndicate, or contractors who are able by means of a practical demonstration to satisfy him of the capacity of the system for continuous efficient communication by day and night over a distance of not less than 2,000 geographical miles. Any person or company wishing to give a demonstration is invited to communicate with the Secretary to the Post Office before November 21st, stating the earliest date on which the demonstration can be given.

Japan.—Some new arrangements have lately been concluded between the Japanese Government and the Great Northern Telegraph Co., whereby the former is laying a new cable between Nagasaki, Japan, and Shanghai, China. The line will, however, be limited to the transmission of Japanese telegrams and Japanese and Chinese official dispatches. The cable between Formosa and Chuanchishan, which has hitherto been exclusively used for the service of the island, will in future be utilised for general international purposes, while the Ogasawara cable, which has hitherto been used for messages to America only, will now be employed also for messages to Hong Kong.

Johnson-Varley System.—Mr. A. T. M. Johnson (director of the Universal Cheap Cables, Ltd., and the Johnson Secret Wireless Telegraph and Telephone Testing Syndicate, Ltd.) (in liquidation), has issued a circular to the shareholders, in which he states that "before the end of the present year the directors will be in a position to prove that the Johnson-Varley system is the only perfectly selective and secret system of wireless telegraphy in the world."

New Cable.—A new telephone cable is being laid between Holyhead and Dublin by the Post Office cable ship *Monarch*. The distance is a little over 50 miles, and the cable will be laid in two sections. Messages will go *via* Manchester.

Postal Servants.—A letter dealing with the agitation in the postal service over the findings of the Holt Committee has been addressed by the Postmaster-General to the National Joint Committee representing the Postal Unions. Mr. Samuel states that: "There is no prospect of the Government granting more money in increased wages than the sum recommended by the Committee. Withdrawal of labour by any member of the staff must be regarded as his resignation from the service," and it will be treated accordingly.

At a meeting of all grades of postal, telegraph, and telephone workers, at Bow, on Sunday, a resolution was passed condemning the Holt report. Mr. W. J. Ash, of the Postal Telegraph Clerks' Association, who presided, said that if the Postmaster-General's verdict was against them, there was nothing to stop their saying they were going to withdraw their labour. If postal and railway workers combined, something would happen.

The interview which the postal employés were to have had with the Postmaster-General on Tuesday in order to discuss the Holt report has been postponed until the 19th inst.

State-owned Cables.—At a sitting of the Dominions Royal Commission on Wednesday, Mr. Crabb, Second Secretary to the Post Office, said that the existing service provided by the Atlantic Cable Companies, was a good one, and the Post Office was convinced that the laying of a State-owned cable was not commercially justifiable. The cost of telegraphing had diminished at least 50 per cent. during the past 10 years. The possibilities of wireless telegraphy could hardly be overstated.

The Railophone System.—A number of erroneous reports having appeared in the daily Press, with regard to the experimental adoption of the Railophone system by the Midland Railway Co., the inventor, Mr. H. von Kramer, has issued a statement describing the system, which is being installed on a section of the Midland Railway near Derby.

Wireless Amateurs.—There has recently been a large increase in the number of licences granted by the Postmaster-General to amateur workers: at the close of the last financial year, March 31st, 1913, the number was 992, as compared with 258 at the end of the previous year, and there has been a considerable addition to the list during the first six months of the current financial year. In the majority of cases amateur stations are limited to a transmission range of about 20 miles, but a few of the more powerful installations have, when efficiently operated, a radius of about 100 miles. In addition to the Wireless Society of London, which hopes to include in its membership the large number of amateurs who have installations in the metropolitan district, wireless clubs have been formed at Derby, Liverpool, Northampton, Birmingham and Leicester, and efforts are being made to form similar societies or clubs elsewhere.

Wireless Telegraph Research.—The Postmaster-General has appointed a Committee "to consider how far, and by what methods, the State should make provision for research work in the science of wireless telegraphy, and whether any organisation which may be established should include problems connected with ordinary telegraphy and telephony." The members of the Committee are as follows:—

The Right Hon. C. E. H. Hobhouse, M.P. (chairman); the Right Hon. Lord Parker of Waddington; Sir Joseph Larmor, M.P., F.R.S.; Sir Henry Norman, M.P.; Dr. R. T. Glazebrook, F.R.S.; Mr. W. Duddell, F.R.S; Mr. R. Wilkins, C.B.; Rear-Admiral E. F. B. Charlton, R.N.; Commander J. K. Im Thurn, R.N.; Sir Alexander King, K.C.B.: Mr. W. Slingo; Commander F. Loring, R.N.; Major the Hon. H. C. Guest, M.P. The office of the Committee is at 6, Catherine Street, Strand.

The Postmaster-General is going to erect a small wireless station on the Marlborough Downs at a point about 5 miles from Devizes.

Wireless Telegraphy on Salvage Vessels.—The Dover Harbour Board, after obtaining tenders from manufacturers of wireless telegraph apparatus, have decided to equip their two salvage vessels—ss. *Lady Brassey* and ss. *Lady Crundall*—with wireless apparatus upon the quenched-spark system. The installations will be manufactured at Messrs. Siemens Bros.' Woolwich works, and will be of their "B" type, the guaranteed ranges being 100 miles by day and 160 miles by night. This installation transmits about 0·2 KW. of electrical power. The major portion of the apparatus is enclosed in a cabinet, the dimensions of which are not greater than 4 ft. 8 in. × 2 ft. 2 in. × 2 ft. 2 in.

Wireless Telephony.—According to the *Telephone Engineer*, wireless telephone messages were lately sent over a distance of more than 600 miles, from Rome to Tripoli, by Prof. Vanni, of the Military Wireless Institution, Rome. In these experiments he makes use of a liquid microphone based upon the ideas of Chichester Bell, brother of the celebrated Graham Bell. Using a microphone of this kind together with apparatus of the Moretti type, the voice could be very well heard at Tripoli, and persons there were able to recognise the professor's voice. After improving his apparatus, Prof. Vanni hopes to telephone between Rome and Paris.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Sydney (New South Wales).—March 18th, 1914.—For the Postmaster-General. Seven automatic switchboards. Schedule No. 179. See "Official Notices" October 31st.

December 14th.—Two sections switchboard, common-battery multiple. See "Official Notices" October 17th.

Brisbane.—December 17th. For the P.M.G.: Insulators. See "Official Notices" October 31st.

December 31st. For the P.M.G. Insulators. See "Official Notices" October 31st.

December 22nd. Melbourne Suburban Railways. (1) Track feed boxes, including signal transformers, switchgear and accessories. (2) Track resistances. (3) Impedance bonds. (4) Track relays and relay boxes. Specifications (£5 5s.) from Agent-General for Victoria, on or after November 10th. Consulting engineers, Messrs. Merz & McLellan, 32, Victoria Street, S.W. See "Official Notices" last week.

Canberra.—November 26th. In connection with the preliminary work of the foundation of the Australian capital city, Canberra, there is at present a good deal of activity being displayed, and the Department of Home Affairs of the Commonwealth in Melbourne has issued specifications and conditions of contract for the water supply pumping plant at Canberra, tenders for which close on the 26th inst. Copies of the plans and specifications may be seen at the office of the High Commissioner for the Commonwealth of Australia, 72, Victoria Street, London, S.W.

Victorian Railways.—December 10th. One 15-ton electric crane for Ballarat. Tenders to "Tender Box," Railway Offices, Melbourne.

Belgium.—January 26th. The municipal authorities of Antwerp are inviting tenders for the supply of six electrically operated cranes.

November 16th.—The Fonderie Royale de Canons, in Liége, (80, Quai St. Leonard) is inviting tenders for the supply of the cables and accessories required in connection with the electricity mains that are to be installed at 11 forts in the Liége district, and at nine in the Namur district.

Bootle.—November 19th. 2,000 tons of steam coal and 2,000 tons of slack for the electric light station. Form of tender, &c., obtainable from the Borough Electrical Engineer, Pine Grove.

Bradford.—November 15th. Electrical installation, Technical College, for the Education Committee. City Architect, Town Hall.

Bulgaria.—November 17th. The Bulgarian Bureau of Finance in Sofia is inviting tenders for the supply and erection at the new electricity generating station at the State Collieries at Pernik of the following plant: Three tubular boilers, two 250-H.P. horizontal double-expansion steam engines, two three-phase generators, the necessary switchboards and transformers, and an electrically-operated pump of a capacity of 110 gals. per min.

Canada.—Calgary.—November 18th. City Commissioners, 1,000-KW. synchronous motor-generator and exciter set. Specifications from City Clerk. Deposit $2,000.

Dublin.—November 17th. Twelve months' supply of stores, for Dublin Tramway Co., Ltd. See "Official Notices" October 31st.

Gateshead.—November 25th. Electric lamps, electric wires and cables, electrical sundry fittings, arc lamp carbons, glasses for electric arc lamps, &c., for the North-Eastern Railway Co. Mr. E. H. Clark, Stores Superintendent, Gateshead.

Huddersfield.—November 17th. Slack required for the Electricity Department for 12 months. Particulars obtainable from Borough Electrical Engineer, St. Andrew's Road.

(*Continued on page 793.*)

THE LATE SIR WILLIAM PREECE, K.C.B., F.R.S.

Exactly 12 months ago, in an article in which he wished us "Many Happy Returns" on the fortieth birthday of the Electrical Review, Sir William Preece concluded by indulging the hope that he might "live long enough to compliment the Editors and proprietors at some future day on the jubilee of their achievement."

The fulfilment of that hope has, however, been denied him, for on the morning of Thursday last week, November 6th, he breathed his last at Penrhos, his Carnarvonshire home, where he had been laid aside for some time.

Within a few months he would have completed his eightieth year, and when it is remembered that it was in the days when Faraday was in his prime, occupying the minds of students of the day with his new electrical theories, propounded before the Royal Institution, that Preece came under his spell, and became his assistant, it will be observed that for more than 60 years he had been intimately interested in electricity and electrical applications. That is a record of which but few can boast. A man of even average activity and average ability can achieve much in 60 years; but Sir William was more assiduous than most, and possessed many excellent qualities and gifts, which he untiringly turned to good account in a variety of directions, and which brought him into more or less prominence.

Born at Carnarvon in 1834, and educated at King's College, London, after a brief experience in the engineering offices of the late Edwin Clark, he was, in his twentieth year, given an appointment with the Electric and International Telegraph Co., becoming Superintendent of the Southern Division in 1856. Subsequently he was employed as engineer in connection with the Channel Islands Telegraph Co. and as Telegraph Superintendent of the L. and S.W.R., and when the telegraphs were transferred to the State in 1870, he became a Divisional Engineer in the Post Office. Seven years later he was appointed Electrician, which rank he held for 15 years, until he became Engineer-in-Chief and Electrician in 1892. After another seven years he retired from active State service, but acted as consulting engineer to the British Post Office and the Colonies. On his retirement in 1899, he was honoured with Knighthood. Sir William, of course, did not cease from engineering interests when he left the Post Office, but joined his sons and Major Cardew in the consulting practice in which they were engaged at Westminster, and which is to-day so well known under the firm name of Preece, Cardew & Snell.

It was during his period as Engineer-in-Chief to the Post Office that Mr. Marconi came upon the scene in 1896, and Sir William, who had for many years been engaged upon important experiments in wireless transmission by electromagnetic waves, gave him every opportunity to demonstrate the practicability of his Hertzian wave system which has had so fine a record since. Indeed, one of the first to express sympathy with Sir William's relatives on Thursday last week was Mr. Marconi, who in his message said that the deceased gentleman was the first person in England to take an interest in his experiments and to lecture upon them. "It was due to his influence that I received considerable encouragement from the British Post Office."

In his official position, Sir William was perhaps mainly concerned with telegraphic and telephonic matters, but even as long ago as the date of his retirement, now some 14 years ago, electricity was rendering service in many other ways in connection with the vast undertakings of the Post Office.

The scientific institutions with which he was connected were numerous. As long ago as 1880 he was a president of the Society of Telegraph Engineers, and in 1893 he again presided over the deliberations of that organisation under its now better-known name, the Institution of Electrical Engineers. In 1881 he was elected a Fellow of the Royal Society. In 1888 he was Chairman of the Engineering (or Mechanical Science) Section of the British Association for the Advancement of Science, before which, 11 years earlier, he had exhibited the "first pair of telephones" shown in England—he referred with obvious pride to this interesting episode in his connection with matters telephonic in many of his public speeches in later years. Sir William was in 1898 President of the Institution of Civil Engineers, and he was also a Member of the Institution of Mechanical Engineers, the Physical Society, and the Meteorological Society. He was the author or joint author of many addresses and papers which are to be found in the *Proceedings* of these bodies, and a large number of them were reprinted in the pages of the Electrical Review. He was also the author of a number of standard works, notably the "Text-book of Telegraphy," which he prepared in collaboration with Sir James Sivewright; "The Telephone," in collaboration with Dr. Julius Maier; and later the "Manual of Telephony," in collaboration with Mr. A. J. Stubbs.

In recent years Sir William Preece had interested himself in movements for the better organisation of the electrical industry, and he showed a marked solicitude on behalf of the electrical worker who had fallen or was falling in the struggle, his sympathy and anxiety taking a very practical shape in his support of the Electrical Trades Benevolent Institution of which he was chairman of the committee almost from its inception and was president right up to the last.

> "A man so various that he seem'd to be
> Not one, but all mankind's epitome."

To Sir William's family—several of his sons are well known throughout the electrical profession—we tender our deepest sympathy in their bereavement.

The remains were laid to rest in the family grave at the Llanbeblig Parish Churchyard, Carnarvon, at noon on Tuesday, and a Memorial Service was held at St. Margaret's, Westminster, at the same time.

A large company assembled at the graveside at Carnarvon. The chief mourners included three of Sir William's sons—Mr. A. H. Preece, Mr. P. J. Preece, Mr. F. H. Preece; Mrs. Llewellyn Preece; Mr. and Mrs. David Moseley, son-in-law and daughter; the Misses M. F. and Amy Preece, daughters; and Mr. J. R. Preece, brother. The firm at Westminster was represented by Mr. J. H. Woodward. The Mayor and Corporation of Carnarvon were in attendance, and representatives were also present from the local Harbour Trust and the British and Foreign Bible Society, with both of which the late Sir William was identified. The vicar conducted the service. Among the wreaths were tributes from the President and Council of the Institution of Electrical Engineers, the Electric Lodge of Freemasons, and the American Institute of Electrical Engineers. Many messages of condolence were received, among them being one from the Postmaster-General and another from Lady Kelvin.

At the memorial service held at Westminster, a distinguished company was present, including Sir John Gavey, the Hon. R. Clere Parsons, Sir A. F. King, Sir J. A. Ewing, Prof. S. P. Thompson and Prof. Unwin representing the Royal Society, Prof. E. Wilson (King's College), Mr. W. Slingo (Engineer-in-Chief to the Post Office), Mr. A. P. Trotter, Dr. Glazebrook (National Physical Laboratory), Prof. Fleming, Mr. J. F. C. Snell and Mr. Alexander Siemens.

On behalf of the President, Mr. C. O. Mailloux, the directors, and members of the American Institute of Electrical Engineers, a handsome wreath was sent down to Carnarvon, and the Institute was officially represented at the memorial service at St. Margaret's, by Mr. C. Le Maistre, secretary of the I.E.E., in the absence of Dr. H. F. Parshall, who is abroad.

By the instruction of the Committee of the Electrical Trades Benevolent Institution, Mr. F. B. O. Hawes, the secretary, sent a letter of condolence to the members of the family, and in the absence of Mr. Justus Eck, the chairman of the Committee, Mr. Hawes represented the Institution at St. Margaret's.

SIR WILLIAM PREECE.

By SIR JOHN GAVEY.

One of the best known personalities in scientific, electrical and engineering circles has passed away, after an active career extending over nearly 60 years. Always in the limelight, he was an indefatigable worker, who commenced his day's operations at 6 a.m., appeared at his offices from 10 to 7, and thence till midnight was to be encountered at any one of the many scientific and social functions in London, where his cheery presence was always welcome. He was a miracle of industry, and only the strongest constitution would have permitted such a constant strain as his was exposed to without serious results. He was equally at home and equally well known in the United States of America, which he visited several times, and on the Continent of Europe where he represented the service of the State on sundry occasions, as he was in London.

Photo. by] *[Histed.*

He was one, of whom few are now left, who witnessed the entire growth of modern electrical engineering, and who himself took a most active share in its development all through his life. To look back to the period when he commenced his career, when electrical engineering was confined to telegraphy, when only minute electrical currents of a few milliamperes could be generated and maintained for any lengthy period, when there were no units of measurement other than the resistance of a mile of No. 16 B.W.G. copper wire of indefinite composition, and the potential of a Daniell's cell was the standard of voltage, when submarine telegraphy was in its infancy and land telegraphy only partially developed, and when there was scarcely a text-book on electricity and magnetism worthy of the name, and to compare that period with the present when electrical engineering embraces every sphere of life and has invaded every branch of industry and electrical literature suffices to fill a large library, enables one to realise the intense happiness which a man of his personality must have enjoyed in a life spent in the midst of the growth and development of the art to which he was wedded and which in so few years have led to such results.

His general career has been described elsewhere, but perhaps a brief reference to one or two incidents may not be amiss.

When associated with the London and South-Western Railway in the sixties, his practical mind turned to the subject of block signalling on railways, which was then only very sparingly used by a few companies. He devised a system the prominent feature of which was the reproduction of the outdoor signals by miniature signals placed in the signal boxes and worked electrically. He was thus an early pioneer in one branch of electrical work, which, as now in use, doubles the carrying capacity of our railways.

Later he was in America when Graham Bell produced the form of telephone that is now in practical use throughout the world as a receiver, and those who knew him well can realise the sanguine joy with which he exhibited the two telephones he brought back with him. In the course of the year 1877 he delivered a lecture on the subject before the British Association at Plymouth, and to illustrate it he arranged that an assistant should speak from Exeter to Plymouth late in the evening when the wires were idle. At the close of his lecture he invited one of the most eminent persons in the audience to open the conversation. The gentleman took up the instrument, and shouted, "Hi diddle, diddle!—follow that up." A slight pause, when he repeated triumphantly, "The cat and the fiddle." The next day we heard from our friend who had returned to Plymouth, that he had not distinguished a word owing to the induction on the wires, and that his reply was, "I cannot hear you. Repeat." An illustration of the sanguine use of the scientific imagination.

His endeavours to solve the problems of wireless telegraphy are well known, but the narrow limits beyond which it was impossible to communicate by electromagnetic induction between parallel wires led to the abandonment of the method when the Hertzian wave system was introduced.

As a sequel to the numerous experiments in various parts of the country with electromagnetic induction, a trial was made between a point on the coast near Cardiff and the Island of Flat Holm, in the Bristol Channel, the localities in which, by the way, at a later date the crucial experiments with Marconi's methods were conducted.

Two parallel wires being provided, and everything ready for the trial, Preece came down to witness the experiments. The weather proved too stormy to land on the island, and, after a couple of days' waiting, he returned to London. The next day, the weather having calmed, the writer reached the island, and in the course of the day received the first message transmitted by this method across an arm of the sea, which message dramatically announced the death of the then Engineer-in-Chief of the Post Office—Mr. Edward Graves.

No appreciation of his character would be complete without a reference to his pre-eminence as a lecturer or public speaker. When lecturing, the lucidity of his address, his logical methods of leading up to his main points, and his clear illustrations, carried conviction to all. As a public speaker he exercised a magnetic influence over his hearers, and on one occasion when he had been particularly happy, he was styled by a large section of his audience the Demosthenes of Electricity.

To speak at any length of Preece's general work, or of his association with the many institutions to which he was affiliated, would far outstep the limits of this notice.

As an administrator, the one quality which, perhaps, the writer admired most, was his encouragement of originality and of the assumption of responsibility by his assistants and subordinates. These qualities, which are not too generally exhibited by the majority of employés, are not always fostered as they should be by heads of departments. The advantages that young men in their early training derive from being taught at the outset of their careers the very elements of their future success in life are incalculable.

Finally, as an individual he was a warm friend, a genial cheery spirit, with a large fund of humour, enjoying a joke or a good story, but above all his deep and unwearied interest in the development of his profession was his most marked characteristic. His name was almost a household word, and he has left behind him an immense circle of friends to mourn his loss.

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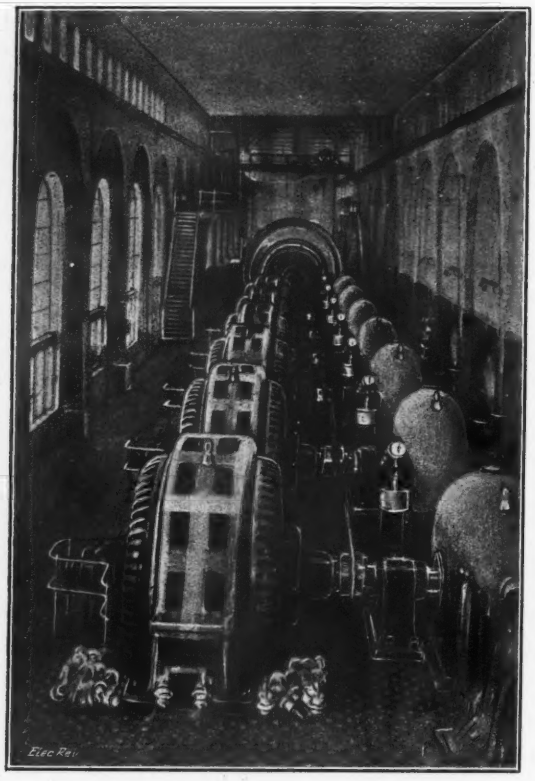
A NORWEGIAN HYDRO-ELECTRIC PLANT.

[BY OUR NORWEGIAN CORRESPONDENT.]

The Tyssefaldene Co. was recently formed for the purpose of developing hydro-electric power from the Tysse River, which flows in the south-west of Norway into the Sör-fjord —one of the many small fjords of the Hardangerfjord.



Interior of the Tysse Power Station.

The river runs through a barren and mountainous district, at an average altitude of 1,000 m. above the sea-level, forming in its course six different lakes, of which the Ringedals Lake and the Vetlevandene are the lower ones. The total area of the watershed is about 378 km. sq., including the above lakes. The power scheme was divided into two sections, the first of which has already been two-thirds completed, while the second stage will be completed later on.

The first section is intended to develop 62,250 KW. at a power station at Tysse, by the installation of the necessary generating plant after the preparatory works in connection with the water supply have been completed.

The second stage includes the erection of a new power station at Skjäggedal, which will be capable of producing 18,000 KW., and be situated on the biggest tributary to the Tysse River, viz., the Mogeli River, which flows into the Vetlevandene after having passed two small lakes. The Skjäggedal station is situated higher up than the Tysse station, and the same water will thus be employed twice. The area of the water shed of the Mogeli River is about 31 km. sq., and the power station will be situated 200 m. higher up than the storage basin for the Tysse station, viz., the Ringedals Lake.

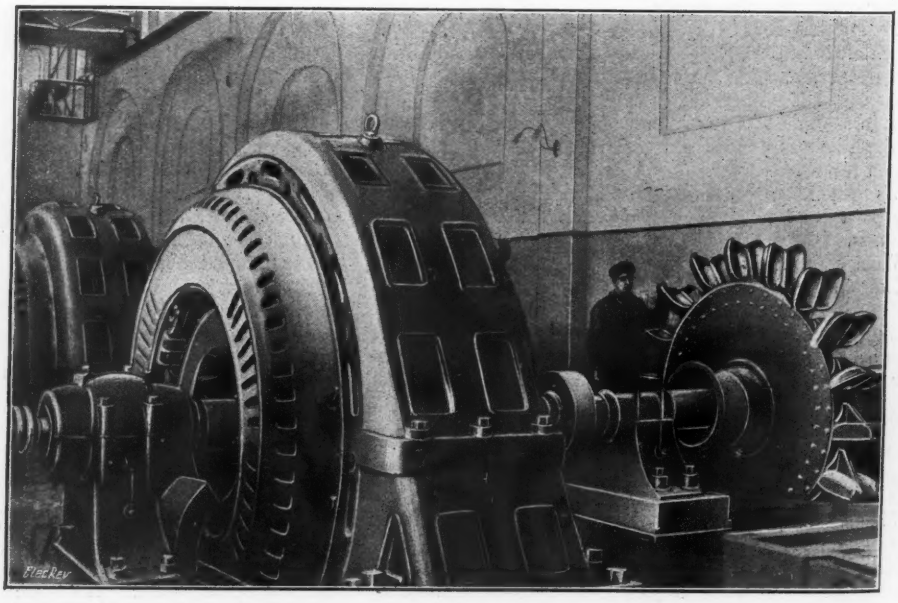
After the completion of the whole scheme the company will thus have for disposal a total of 112,000 KW., viz., about 94,000 KW. from the Tysse Station, of which 62,250 KW. are already provided for and partly in use, and 18,000 KW. from the Skjäggedal Station.

The Tysse Power Plant.—A dam has been built across the lower end of the Ringedals Lake, at an elevation of 448 m., from which the water passes through two tunnels, each 150 m. long, into the Vetlevandene. The tunnels are fitted with a gate and throttle valves for controlling the discharge of water. From the Vetlevandene the water is carried along the side of the mountain through a tunnel constructed in the rock, 3,420 m. long, terminating in the penstock chamber at Tyssenut. From the chamber the water falls through four pipe-lines down to the turbines in the power station, which is on the shore of the Sör-fjord.

Seven main and two exciter units, constructed by the Allmänna Svenska Elektriska Aktiebolaget are in operation, and two other large units with exciters have been delivered by the A.G. Siemens-Schuckert, of Berlin.

The first seven units are horizontal three-phase generators, each having a normal capacity of 3,300 KW., and operating on a power factor of ·8, corresponding to 4,100 K.V.A. These generate 12,000-volt 25-cycle current, and run at 375 R.P.M.; the machines are coupled direct to Pelton turbines. The rotating generator field is manufactured from steel castings with the poles cast on, and has a diameter of 1·95 m.; it is guaranteed to withstand a momentary speed of 700 R.P.M. in case sudden unloading should occur.

The first two exciter machines are shunt-wound generators of 165 KW. each, at 110 volts and 750 R.P.M., and are also coupled direct to horizontal Pelton turbines. In case of accidental unloading they are guaranteed to be able to run at a speed of 85 per cent. in excess of the normal. The two main units of German construction are horizontal three-phase generators, each of 9,600-KW. capacity at 250 R.P.M., the pressure being similar to that of the other units.



3,300-KW. Generating Unit, showing Pelton Wheel.

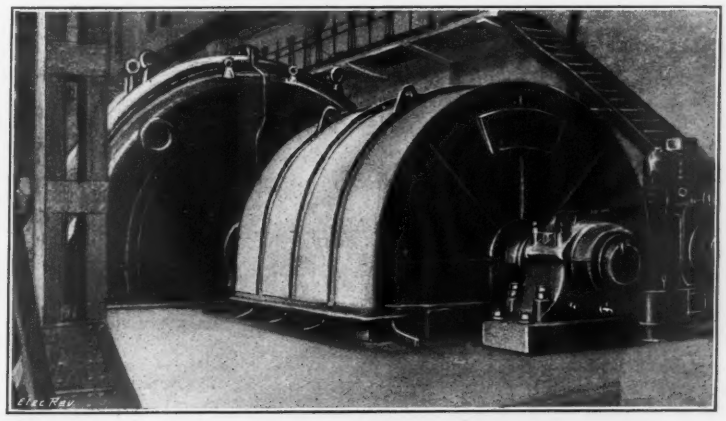
These also are coupled direct to Pelton wheels. The stator, divided into four parts, has an external diameter of 6·8 metres. The rotor is built up solid with 12 poles, and is 4,462 metres in diameter, and complete with the axle, weighs 56 tons. It will withstand momentary increases of speed up to 450 revolutions per minute. The two exciter units are shunt-wound 110-volt generators of 182 KW., and run at 750 R.P.M.; they are direct-coupled to Pelton wheels, and can safely exceed the normal speed by 80 per cent.

Our various illustrations show the interior of the Tysse power station from either end.

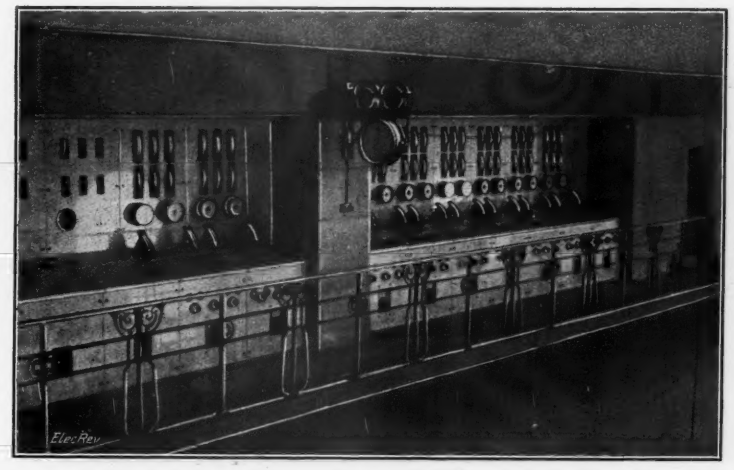
Two units which have been delivered by the Westinghouse Co. are being erected; these are of the same capacity as the Siemens-Schuckert generators. Three further generators will be installed as soon as the extension of the power station is carried out. One of these will have a rated capacity of 13,500 B.H.P., while the two others will be of 15,000 B.H.P. each.

Transmissions.—Only a portion of the energy produced at the Tysse power station is used on the spot; the greatest part is transmitted 6½ km. to Odda, which, from a desolate country place, has grown during recent years into an industrial centre. The chief customer of the A.G. Tyssefaldene at Odda is the Alby United Carbide Factories, which are consuming 47,500 KW., while the North-Western Cyanamide Co. takes 4,500 KW. The Hardanger Electrical Ironworks also has a contract with the company for up to 6,000 KW., but these works have been closed down for the present, and the contract has been taken over by another firm, which is now building factories.

The electrical energy from Tysse to the Alby United Carbide Factories is carried by duplicate transmissions, each consisting of two lines, with three aluminium cables.



9,600-KW. Generating Unit, Tysse Power Plant.



The Main Switchboard.

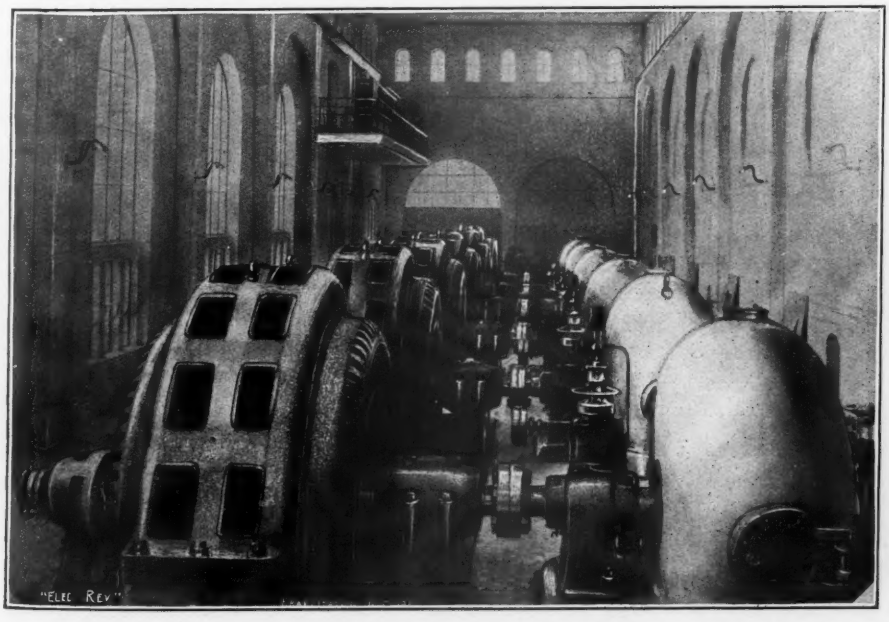
Of the four lines, three are regularly used, the fourth being kept in reserve. The transmission lines are provided with four switch-towers for facilitating their operation.

In one place it has been found necessary to lead the cables through a tunnel 700 m. long, in order to avoid disturbances in the working due to avalanches, &c.

The supply to the North-Western Cyanamide Co. is conducted to the factories by means of two underground lines, each consisting of three copper cables of 120 mm. diameter.

The switchgear and instruments at the power station were supplied by the British Westinghouse Co., and are of the most modern type.

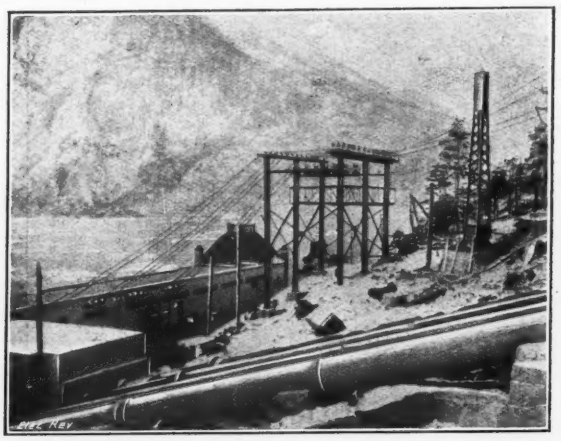
The Tyssefaldene Co.'s plant is typical of the numerous hydro-electric developments which are being carried out in Norway and Sweden at the present time, and which are contributing largely towards the industrial progress of these countries, especially in the production of electro-chemicals, wood pulp, &c., and in the operation of numerous railways.



Another Interior View of the Tysse Power Station.

A BRIGHTON HOTEL KITCHEN.

The directorate of the Old Ship Hotel, with which famous old hostelry a good many of our municipal electrical friends made a passing acquaintance a few years back, have recently carried out some important alterations, including, in addition to certain reconstruction work and refurnishing, the adoption of electrical cooking.

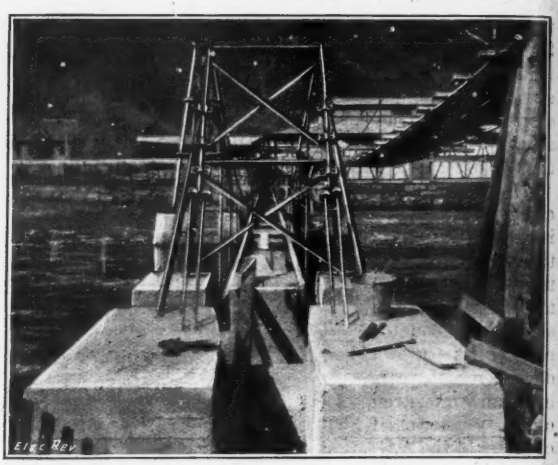


Pipe and Transmission Lines, Tysse Power Plant (Page 791).

Through the courtesy of Mr. John Christie, borough electrical engineer, Brighton, we are enabled to illustrate and give some details of the cooking equipment, which has been installed in a specially-built kitchen, under the direction of his department, by Messrs. Page & Miles, of Brighton, and is entirely dependent on the Corporation electricity supply for current.

The equipment, which was manufactured by the Jackson Electric Stove Co., consists of a range of four ovens, each measuring inside 24 in. × 20½ in. × 20½ in., with hot cupboards separately heated about the ovens; each oven has a 5-kw. loading, and the hot cupboards approximately 2 kw. each, making a total of 24 kw. There are also a grill, 36 in. × 12 in., with a hot cupboard above (7 kw. loading in grill and 1 kw. in hot cupboard) having a total loading of 8 kw.; a fish fryer consisting of two oval pans, each measuring 18 in. × 12 in., fitted with draining rack, and having a total loading of 5 kw.; a hot-plate for boiling purposes, 4 ft. × 2 ft., containing four 12-in. boiling rings, each with a loading of 2·5 kw., making a total of 10 kw.; and two large vegetable steamers with a loading of 10 kw.

The equipment is now doing the whole of the work of the hotel, including banquets, and has given very satisfactory results, as regards the quality of the cooked food, simplicity of operation, and low cost of working with electricity at 1d. per unit, amply vindicating the claims which were put forward by the electricity department when the question was under discussion. The directors, who are to be congratulated on their enterprise in this matter, are now considering the question of electrical heating as well as lighting and cooking; the large garage attached to the hotel has already been fully equipped for charging the batteries of electric automobiles belonging to visitors who may be staying at the hotel.



Transmission over River, Tysse Power Plant (Page 791).

In conclusion, we may congratulate Mr. Christie on having been instrumental in obtaining such an important addition to the list of such installations.

The Specially Built and Equipped Electric Kitchen at the Old Ship Hotel, Brighton.

1913.

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CONTRACTS OPEN.

(*Continued from page 787.*)

Italy.—Naples.—November 29th. Tenders are invited for the supply of all the material and the electrical and mechanical appliances required for three distribution cabins located in Montaquila, Calvi Risonta and Melito, on the transmission line from Cape Volturno to Naples. Preliminary deposit 3,000 lire. Particulars of the Società Volturno, in Naples.

Keighley.—The Tramways Committee has recommended that tenders be obtained for the overhead equipment and trolley vehicles necessary for installing the Cedes-Stoll system of trolley vehicles on the Oakworth and Eastburn routes.

London.—Hammersmith.—November 14th. Corporation: Arc lamps for fixing on consumers' premises, to work two in series on single-phase A.C., 50 periods 110 volts. See "Official Notices" November 7th.

L.C.C.—November 26th. Installation, 140 lighting points, at Hammersmith Trade School for Girls, Lime Grove. See "Official Notices" November 7th.

November 26th.—Installation, 240 lighting points, at Lancaster Road Elementary School, Notting Hill, W. See "Official Notices" to-day.

Fulham.—November 26th. Corporation. 2,500-kw. turbo-alternator and condensing plant. See "Official Notices" to-day.

Manchester.—November 28th. Corporation. Two water-tube boilers and superheaters, economisers, coal chutes, ash conveyor, pipe connections, additional stoker shafting and clutches, and pneumatic ash-handling plant at boiler house No. 2, Stuart Street generating station. See "Official Notices" November 7th.

New Zealand.—January 5th, 1914. The Christchurch City Council invites tenders for series street-lighting plant (1,950 metallic-filament lamps) and accessories. A specification can be seen at the B. of T. C.I. Department in London.

Plymouth.—December 1st. Corporation. Contract No. 31. Ironclad high-tension switch panels. See "Official Notices" to-day.

Rainhill (near Liverpool).—November 24th. Wiring and fittings for new ward, Lancashire County Asylum. See "Official Notices" November 7th.

Rhyl.—November 19th. One 160-kw. Diesel engine set, for U.D.C. See "Official Notices" October 17th.

Spain.—Tenders have just been invited by the municipal authorities of Pals (Gerona province) for the concession for the electric lighting of the town during a period of 10 years.

November 30th. The Spanish Ministerio de Fomento in Madrid is inviting tenders for the concession for the construction and working of a new electric tramway in the Spanish capital, between the Paseo de la Delunas and the Puente de la Princesa.

Valencia.—November 18th. Electric crane for the handling of coal at the port of Valencia. Particulars from the Secretary, Junta de Obras del puerto de Valencia.

The Azores.—The Junta Geral of the district of Ponta Delgada, St. Michael's, Azores, is opening a competition, for 90 days, for the construction and exploitation of an electric railway to be laid between Ponta Delgada and the Valley of the Furnas, and Ponta Delgada and the town of Ribeira Grande. Particulars at the Portuguese Consulate in London and at Messrs. Wm. Hooton and Yates, 12, Fenchurch Street, E.C.—*Financial Times.*

Wakefield (Yorks.).—December 5th. Twelve months' supply of stores, for Yorkshire (West Riding) Electric Tramways Co., Ltd.

Warrington.—November 14th. Telegraph materials and carbons for a year, for the Cheshire Lines Committee. Stores Superintendent, Cheshire Lines, Warrington.

CLOSED.

Australia.—According to the *Australian Mining Standard*, the Sydney Municipal Council has accepted the tender of Messrs. Siemens Bros. for a 1,500-kw. rotary converter, for the Town Hall sub-station, at £4,380; also the tender of the British Insulated and Helsby Cables, Ltd., for 17 feeder pillars, for £975; and that of Messrs. Ferranti, Ltd., for extensions to sub-station L.T. switchboard, at £144.

Victorian Public Works Department:—

Electric lighting plant at Hospital for Insane, Mont Park, £210.—Sutherland & Ashman.
Cables, &c., at the Sanatorium, Cheltenham, £256.—Noyes Bros. Pty., Ltd.

Board of Water Supply and Sewerage, Sydney:—

Insulated cable for Balmain low-level pumping station telephone service.—W. T. Henley's Telegraph Works Co., Ltd.—*Tenders.*

Bridlington.—The T.C. has accepted the tender of Messrs. Willans & Robinson, Ltd., for pipes, valves, plating and pipe covering in connection with the installation of a turbine and generators, at £420, and also for the necessary switchboard panel, at £220, and for spare parts for the turbine, at £36.

Bristol.—The Docks Committee of the T.C. has accepted the tender of the Electric Construction Co., for spare starters for motors at the Royal Edward Dock Granary.

Cambridge.—The C.C. has accepted the tender of Messrs. Baily, Grundy & Barrett, Ltd., for electric light fittings and bells for the new county offices at Cambridge, at £158.

Cape Town.—The tender of Messrs. Siemens, Ltd., has been accepted for petrol engine, dynamo, accumulators and switchboard for the Royal Hotel, Hout Bay, near Cape Town. The contract for the wiring of the hotel, winter garden, tea terrace, &c., has been placed with Messrs. E. A. Shaw & Co., who are also the successful tenderers for the erection of the generating plant.

Germany.—As will be remembered, the Prussian State Railway Administration obtained the sanction of the Diet some time ago to a scheme for the conversion of the Berlin City Railway to electric traction, it being intended to substitute electric locomotives for the existing steam engines, while continuing to use the present carriages. It is now announced that orders have just been placed for the first batch of 60 locomotives, which are to be supplied by the Siemens-Schuckert Works, the A.E.G. and the Maffey-Schwarzkopff Works at a cost of £4,750 per locomotive. Apparently a change in the original programme has been made, for it is stated that the railway authorities intend to erect State power stations of their own at Rummelsburg, near Berlin, and at Charlottenburg respectively, whereas the former scheme was to procure a supply of power from outside sources.

Glasgow.—The Cleansing Committee of the T.C. recommends the acceptance of the offer of the Macfarlane Engineering Co., Ltd., for the supply of three electric motors for power purposes at the granary in Graeme Street.

London.—The Metropolitan Railway Co. has placed a contract for incandescent lamps for next year with the Edison and Swan United Electric Light Co.

Battersea.—The tenders of the Foster Engineering Co., and Electrical Street Lighting Apparatus Co., have been accepted by Battersea B.C. for a supply of metallic-filament lamps for public street lighting and street lighting fittings, respectively.

Marylebone.—Messrs. William Cory & Sons have received the contract from the Marylebone Council for a supply of 20,000 to 25,000 tons of steam coal to the Electricity Department, at 14s. per ton; and Messrs. A. Blackmore & Co., that for the supply of 10,000 tons at the same price.

Newport (Mon.).—The contract for the electric light installation at the new offices for the Monmouthshire County Council has been awarded to Messrs. A. G. Arnold & Son, Newport.

Padiham.—Messrs. Frank Thornton & Co. have secured the contract for the complete electric lighting installation of the new Cinema Theatre, Padiham, near Burnley.

Paisley.—It is stated that Messrs. Fullerton, Hodgart and Barclay have secured an order from the East Rand Proprietary Mines, Ltd., for a large electric winder. The plant is to be capable of winding eight tons of ore from a depth of 4,500 ft. at a speed of 3,000 ft. per minute. The winder is arranged for double motor drive on the "Ward-Leonard" system, and is said to be the largest plant of this type which has ever been installed in any mine. The firm supplied recently to the same mines an installation of four steam-driven air compressors, with a capacity of 38,400 cb. ft. of air per minute.

Sheffield.—The following tenders have been accepted for supplies to the electricity department:—

British Electric Transformer Co., Ltd.—Two 100-k.v.a. testing transformers, £168.
Firth, Blakeley, Sons & Co., for Neepsend power house, wrought-steel shoot, £116.
Army and Navy Manufacturing Works, Ltd.—1,200-1,300 uniform caps, 2s. 9½d. each, and 1,200-1,300 black waterproof covers, 5½d. each.
West End Clothiers Co., Ltd.—1,200-1,400 pairs of trousers, 12s. per pair; and 350-400 motormen's melton reefers, 22s. 6d. each.
R. S. Whitworth, Ltd.—600-700 conductors' serge reefers, 20s. 3d. each.
Brightside Foundry and Engineering Co., Ltd.—Engineering work at Holme Lane Car Depôt, £11,118.

Tunbridge Wells.—The Corporation cable contract for the ensuing year has been placed with the Western Electric Co., Ltd.

Walsall.—The T.C. has accepted the tender of Callender's Cable Co., Ltd., at £124, for laying a length of cable from the Bridgeman Street sub-station to the corner of Queen Street. The tender of the British Westinghouse Co., Ltd., has also been accepted, at £27, for the supply of a motor and starter.

Worthing.—The T.C. has accepted the tender of Messrs. Mirrlees, Bickerton & Day, Ltd., for a Diesel oil engine and generator at the electricity works, at £4,468.

FORTHCOMING EVENTS.

Greenock Electrical Society.—Friday, November 14th. Paper on "Electric Tram-Car Equipment," by Mr. S. James, and visit to depôt.

Junior Institution of Engineers.—Friday, November 14th. At 8 p.m. At Victoria Station Restaurant. Smoking Concert. Saturday, November 15th. At 3 p.m. Visit, Saltley Gas Works, Birmingham.
Monday, November 17th. At 7 p.m. At Institution of Electrical Engineers, Victoria Embankment. Annual general meeting. Benevolent Fund annual general meeting, and paper on "The Institution," by Mr. E. King.

Northampton Engineering College Engineering Society.—Friday, November 14th. Discussion on "The Future Sources of Energy."

Physical Society of London.—Friday, November 14th. At 8 p.m. At Imperial College of Science, S.W. Papers on "Thermal Conductivity of Mercury by the Impressed Velocity Method," by Mr. H. R. Nettleton, B.Sc. "Polarisation and Energy Losses in Dielectrics," by Mr. A. W. Ashton, D.Sc. A Lecture Experiment to illustrate Ionisation by Collision and to show Thermoluminescence, by Mr. F. J. Harlow, B.Sc.

Association of Mining Electrical Engineers (West of Scotland Branch).—Saturday, November 15th. At 4.30 p.m. At Royal Technical College, Glasgow. Paper on "Wireless Experiments," by Mr. J. R. Laird.

North-East Coast Institute of Engineers and Shipbuilders (Graduates' Section).—Saturday, November 15th. At 7.15 p.m. Paper on "Centrifugal Pumps," by Mr. A. Temple Thorne, B.Sc.

Electro-Harmonic Society.—Monday, November 17th. At Holborn Restaurant. At 8 p.m. Ladies' Night.

Institution of Electrical Engineers (Newcastle Local Section).—Students' Section. Monday, November 17th. At 8 p.m. At Armstrong College. Inaugural meeting.

North of England Institute of Mining and Mechanical Engineers (Newcastle Section).—Monday, November 17th. At 8 p.m. At Chemical Theatre, Armstrong College. Third lecture on "Utilisation of Fuel," by Prof. J. W. Cobb.

Institution of Engineers and Shipbuilders in Scotland.—Tuesday, November 18th. At 8 p.m. At Rankine Hall, 39, Elmbank Crescent, Glasgow. Papers.

Institution of Electrical Engineers (Manchester Local Section).—Tuesday, November 18th. At 7.30 p.m. At the University (Physical Laboratory). Paper on "A Two-rate Tariff System Without Time-operated Control," by H. H. Perry.

Illuminating Engineering Society.—Tuesday, November 18th. At 8 p.m. At Royal Society of Arts, 18, John Street, Adelphi. First meeting.

Batti-Wallahs' Society.—Wednesday, November 19th. Informal Evening.

Royal Society of Arts.—Wednesday, November 19th. At 8 p.m. At John Street, Adelphi. Opening meeting.

Chemical Society.—Thursday, November 20th. At 8.30 p.m. At Burlington House, Piccadilly, W. Ordinary meeting.

Institution of Mechanical Engineers.—Thursday, November 20th. At 7.30 p.m. At Memorial Hall, Manchester. Paper on "Cutting Power of Lathe-Turning Tools," by Prof. W. Ripper. Members of Manchester Association of Engineers are invited. Friday, November 21st. At 8 p.m. At Meeting Hall, London. Same paper.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued for the current week :—

Monday, November 17th.—"A" Company. Technical instruction, 7 p.m. to 10 p.m.

Tuesday, November 18th.—"B" Company. Ditto.

Wednesday, November 19th.—Recruits only. Infantry drill and technical instruction, 7 p.m. to 10 p.m.

Thursday, November 20th.—"C" Company. Technical instruction, 7 p.m. to 10 p.m.

Friday, November 21st.—"D" Company. Technical instruction, 7.30 to 10 p.m.

Saturday, November 22nd.—Headquarters will be opened for the transaction of regimental business from 10 a.m. till 12 noon.

(Signed) P. H. Campbell, Captain R.E., Adjutant.
For Officer commanding L.E.E.

NOTES.

Copper.—Messrs. Merton's statistical circular for October shows a decrease in English stocks of 1,856 tons, while French stocks have increased 258 tons during the month. The quantity generally known as "European supplies" stands at 21,350 tons, showing a decrease of 1,173 tons on the month. The supplies, including Rotterdam, Hamburg and Bremen, and estimates for other ports, are 27,377 tons.

Arrivals from North America have been low, from Spain and Portugal (always a fluctuating quantity) high, from Chile average, and from Australia slightly under the average. "Other countries" not specified by name have this month contributed 6,517 tons to England and France. This month American supplies are 60 per cent. of the whole delivery. Deliveries at 40,991 tons are fair, but below the average. The world's supply at the end of September was 41,119 tons. American stocks were given as 13,300 tons. In the face of such a position the moderation of the price is worthy of notice.

Royal Commission on Railways.—The first meeting of the Commission for the purpose of hearing evidence will be held to-day, Friday, November 14th, at Winchester House, St. James's Square, at 10.30 a.m.

Foreign Trade in October.—The following are the electrical and machinery figures given in the official returns for October trade :—

IMPORTS.	*Month of Oct.* £	*Inc. or dec.* £	*Ten months, 1913.* £	*Inc. or dec.* £
Electrical goods, excluding machinery and uninsulated wire	146,858	+ 7,035	1,277,781	+ 101,582
Machinery	656,539	+ 6,545	6,101,150	+ 455,327
EXPORTS.				
Electrical goods and apparatus, excluding machinery and uninsulated wire ...	356,763	− 189,816	4,121,152	+ 375,803
Machinery ...	3,271,296	− 174,574	30,760,860	+ 3,258,605

Northampton Polytechnic Institute.—The annual prize distribution, by Mr. Cyril S. Cobb, chairman of the L.C.C., takes place on Friday, December 5th.

Nobel Prizes.—The Swedish Academy of Sciences has decided to award this year's Nobel's Prize for Physics to Prof. Kamerlingh Onnes, of Leyden, Holland, and the Prize for Chemistry to Prof. Alfred Werner, of Zurich. Each prize is worth about £7,880.

Institution and Lecture Notes.—ROYAL SOCIETY OF ARTS.—The arrangements for the present session include the following :—

Wednesday, November 19th.—Opening meeting. Address, by Col. Sir T. H. Holdich, R.E., &c.

Wednesday, December 10th, at 8 p.m.—Mr. T. Thorne Baker, on "Applications of Electricity to Agriculture and Life."

PAPERS TO BE READ AFTER CHRISTMAS.

A. J. Wallis-Tayler, Assoc.M.Inst C.E., "The Preservation of Timber."
W. R. Ormandy, D.Sc., F.C.S., M.I.Automobile Eng., "Alcohol as a Motor Fuel."
F. W. Goodenough, "Coal Gas as a Fuel for Industrial Purposes."
W. S. Rogers, "Posters."
W. B. Bottomley, M.A., Ph.D., F.L.S., "Bacterial Treatment of Peat, and its Application as a Fertiliser."
Sir R. W. Perks, Bart., Assoc.Inst.C.E., "The Montreal, Ottawa and Georgian Bay Canal."

CANTOR LECTURES.

Monday evenings, December 1st, 8th and 15th at 8 o'clock.—E. G. Coker, M.A., D.Sc., Professor of Mechanical Engineering and Applied Mathematics, City and Guilds of London Technical College, "The Measurement of Stresses in Materials and Structures." Three lectures.

Monday evenings, March 16th, 23rd, 30th.—W. A. Bone, D.Sc., Ph.D., F.R.S., Professor of Chemical Technology, Imperial College of Science and Technology, "Surface Combustion." Three lectures.

JUVENILE LECTURES.

Wednesday evenings, January 7th and 14th, at 5 o'clock.—R. P. Howgrave-Graham, M.I.E.E., Demonstrator in Applied Physics, City and Guilds of London Technical College, "Electric Vibrations and Wireless Telegraphy." Two lectures. The lectures will be fully illustrated with simple experiments.

BRADFORD ENGINEERING SOCIETY.—At a meeting of the Society at the City Technical College on Monday, Mr. M. C. Wheat lectured to a large audience on "Incandescent Electric Lamps and Modern Industrial Lighting," with particular reference to lighting in works and cabinet demonstrations. The lecture was illustrated with lantern views and cabinet demonstrations. The lecturer spoke of the proved increase of output in works as result of effective electric lighting, and the importance of it in regard to cleanliness and the comfort and health of the workers. So great an advantage in increased output and avoidance of spoilage was obtained, that in many instances the cost of an installation had been repaid in a very short time. Mr. Wheat strongly emphasised the importance of keeping the lamps free from dirt. He described in detail the methods of direct lighting, and demonstrated the points to be observed in order to secure good illumination, in contradistinction to mere glare. To illustrate this he showed a 40-watt light under a reflector, producing as good illumination as 500 watts of glare light from bare lamps. Mr. Wheat also dealt with the drawbacks of direct lighting, and the advantages of indirect lighting.

INSTITUTION OF MUNICIPAL ENGINEERS.—At a special general meeting on Friday last, changes of the by-laws were approved. The Report of Council for the year ending June 30th, showed that the membership had increased from 882 to 915 during the year, and that income exceeded expenditure by £122, bringing the accumulated balance to £356.

The address of the president, Mr. Horace Boot, dealt mainly with matters relating to the affairs of the Institution and its members. He referred to the unfair competition of motor-'buses with municipal tramways, and the wide scope for extension of the railless trolley system. A paper by Mr. R. J. Spencer-Phillips on "Electricity as a By-Product," showed how mill-owners and municipalities could co-operate to secure a cheap supply of electrical energy.

In the evening a conversazione was held, at which there was a large attendance.

ROYAL SOCIETY.—Sir William Crookes, O.M., D.Sc., is recommended by the president and Council of the Royal Society for election as president at the anniversary meeting on December 1st.

INSTITUTION OF ELECTRICAL ENGINEERS.—The programme of the Birmingham Local Section includes the following :—

November 26th.—S. Evershed, "Characteristics of Insulation Resistance, with an Appendix on Insulation Values."
December 10th.—A. R. Everest, "Notes for a Discussion on the Rating of Electric Machinery."
December 19th.—Annual Dinner.
January 7th.—H. R. Speyer, "The Development of Electric Power for Industrial Purposes in India."

I.E.E.—At the meeting of the Scottish Local Section on November 11th, in Glasgow, Mr. J. A. Robertson, chairman, opened the session with an address on "Recent Progress and Limitations in Electrical Development."

I.E.E.—At the meeting of the Birmingham Local Section on Wednesday last, a paper was read by Mr. A. H. Holden on "The British Standard Specification for Consumers' Electric Supply Meters." The reading of the paper was followed by a discussion, in which representatives of manufacturers and municipal authorities took part. An abstract of the paper appears elsewhere in this issue.

Institution of Post Office Electrical Engineers.—A paper on "Telephone Engineering Economics," with special reference to underground pipes and cables, was read by Mr. Harvey Smith on Monday last.

Educational Notes.—Imperial College of Science and Technology.—City and Guilds (Engineering) College, South Kensington :—An advanced course of lectures is to be given on the Principles, Designs and Manufacture of Electromagnetic Machinery and Transformers; Series II. Conducted by Dr. S. P. Smith. See our advertisement pages to-day.

A new department for the study of chemical technology is being erected in connection with the Imperial College of Science and Technology in South Kensington. Prof. W. A. Bone, F.R.S., has been placed in charge of it.

The University of Bristol has made a regulation whereby the Bath Municipal Technical School will be connected with the Faculty of Engineering of the University, which is provided and maintained in the Merchant Venturers' Technical College.

The new buildings of the applied science department of Sheffield University, opened by Lord Haldane on October 25th, are mainly devoted to mining and metallurgy, and include important electrical sections. The electroplating department is planned for work of all classes on a practical scale, and the recalescence laboratory has been provided with electric vacuum furnaces and electrical apparatus forming the most complete equipment in existence. Electrical furnaces are installed in the melting shop, capable of making 90-lb. ingots.

Electricity Supply Rifle League.—The following matches were decided during September :—Brompton (Nash 96), 549; Central (Wells 100), 570. Brompton (Willis 98), 563; Hackney (Barham 94), 536. Central (Wells 95), 558; Hackney (Hilling, Mathews 96), 546. Ilford (R. Tufnell 97), 567; Poplar (Mogg 93), 526. Ilford (L. Tufnell 99), 553; Stepney (Barber 96), 519. Poplar (Mogg 94), 523; Stepney (Barber 99), 549. St. James' (Cockburn 98), 537; Shoreditch (Ebner 98), 577. St. James' (Cockburn 97), 550; Westminster (Neville 97), 570. Shoreditch (Ridd 93), 547; Westminster (Horley 96), 568.

The following are the positions to date :—

	Matches.				Scores.	
	Shot.	Won.	Lost.	Points.	For.	Against.
Westminster ...	10	9	1	18	5,700	5,472
Shoreditch ...	10	8	2	16	5,691	5,441
Ilford	10	8	2	16	5,633	5,375
Central	10	7	3	14	5,630	5,463
Brompton ...	10	6	4	12	5,577	5,451
St. James' ...	10	3	7	6	5,373	5,554
Hackney ...	10	2	8	4	5,406	5,477
Stepney	10	2	8	4	5,395	5,387
Poplar	10	0	10	0	4,810	5,595

The fixtures for 1914 will soon be under consideration, and with this in view all the electricity works within the 20-mile radius from Charing Cross have been circularised, but up to now not many have replied. Most works ought to be able to muster eight men who can use a rifle; the cost of running a club is not great, and in the majority of cases range accommodation is easy to get somewhere about the works.

The hon. secretary, Mr. E. Mathews, 306, Mare Street, Hackney, N.E., will be pleased to answer inquiries.

Manchester Engineers' Club.—In connection with the opening of the above club, a lunch was given by the directors on Thursday last week to the Life Members, Committee and the Press. Close upon fifty persons were present, including Sir Charles Behrens (Deputy Lord Mayor), Dr. Ed. Hopkinson, Dr. G. J. Fowler, Mr. E. H. Langdon (president of the Chamber of Commerce), Councillor Simpson (solicitor to the club) and Mr. J. B. Broadbent, A.R.I.B.A. (architect). Sir Charles Behrens proposed the toast of "The Engineers' Club," and hoped that it would be successful. The chairman (Mr. Daniel Adamson), in responding, said that the club was the only one of its kind in the country, and to find a club of a similar kind they had to travel to New York, where there was an Engineers' Club with a membership of about 2,000. They did not intend the club to interfere in any way with any of the existing technical societies, but it would be a common meeting-place for members to entertain their friends, and would form a most suitable place for receiving eminent engineering visitors to the city. He thanked the life members, shareholders and the Press for the work they had done in helping to form the club. Mr. W. Cramp proposed "The Guests," and Mr. E. H. Langdon, in responding, said that at the last Census of Production the value of the engineering output of the country in wages, dividends and taxation was £712,000,000, and was only exceeded by the cotton and coal trades. Mr. G. D. Seaton, in his own inimitable style, proposed the toast of "The Press." He expressed the thanks of the Committee for the help and encouragement given, particularly in the early days, towards the formation of the Club. Mr. H. W. Brady, of the *Manchester Guardian*, responded.

The club premises are situated in Bridgwater Buildings, Albert Square, and occupy four floors, comprising dressing rooms, cloak rooms and lavatories, smoke room and library, dining rooms, and a billiard room on the top floor, together with manager's office, kitchen, &c. The building, which was formerly occupied by the Arts Club, has been entirely refurnished and decorated under the direction of the Committee, assisted by Mr. J. B. Broadbent, architect. The furniture and carpets have been supplied by Mr. J. B. Heighway, and the decorations have been carried out by Messrs. Goodalls. A passenger lift has also been fitted for the use of members.

Fatalities.—An inquest was held on the 5th inst., at Dunston-on-Tyne, into the death of Thomas Bradley, 25, a locomotive engine driver, engaged at Messrs. Mawson, Clark & Co.'s oil works at Dunston. The evidence was to the effect that Bradley had to stop late on Monday, the 3rd inst., to repair a valve that had been leaking, and was handling an electric hand lamp, of about 250 volts, when he received a shock that proved fatal. The whole of the electric plant had been overhauled about seven weeks ago; the lamp had since been frequently used, and there had been no complaint. Henry James Greener, a clerk, said that Bradley complained that someone had stolen his lamp, but a little while after witness saw Bradley at the fitter's bench holding with both hands the metal framework of the lamp. Witness thought that the man was dancing in fun, but soon saw it was serious, and ran to Bradley's assistance. He took hold of the man's hand and got a shock, having difficulty in freeing himself. He then put his arms round Bradley, and got him away, but he thought he was then dead. Mr. Lauder, H.M. Inspector, examined the lamp, and pointed out the defect. It was admitted that there was no earth connection. Dr. Andrew Dougall said death was due to electric shock. He did not think that any of the ordinary methods of resuscitation had been used. In all such works there should be one or two trained first-aid men; had artificial respiration been properly applied, Bradley's life might have been saved. A verdict of death from electric shock was returned.

Mr. J. A. K. Ferns, deputy-coroner, held an inquest at Hyde on October 31st, regarding the death of George Barton (59), labourer, of Hyde. Deceased was working at the Cheshire Cheese Hotel, Gee Cross, when he received an electric shock through grasping a cellar door handle, the rear part of the latch of which had pierced the wood casing, and come in contact with a live wire in the wall. Death was instantaneous. A voltmeter showed that the pressure was 220 volts.

Mr. David K. Cant, an electrician, who put in the installation, said the wood casing was chosen for safety. The door latch was an old one, and might easily pass unnoticed by the man who carried out the work.

The engineer-in-chief to the Stalybridge, Hyde, Dukinfield and Moseley Joint Board (Mr. R. Blackmore) said the system was carried out strictly in accordance with the requirements of the Board of Trade, and in this case the usual regulations were complied with. Some men were more susceptible to shock than others. All his men were touching 230 volts all the week through.

A verdict of "Accidental death" was returned.

An inquest was held on November 11th, on the body of Amos Boniface, an electrical labourer on the Brighton Co.'s Railway, who died as a result of coming into contact with a live wire at London Bridge Station.

Evidence was given before Sheriff Mitchell and a jury, in the Stirling Sheriff Court, into the circumstances attending the death of James Waugh, fireman, Dennyloanhead, who was killed in No. 3 Broomrigg Colliery, belonging to the Banknock Coal Co.

Mr. Robert Nelson, H.M. Electrical Inspector of Mines, held that the deceased received a shock from the haulage rope, as the result of a fault which had been found in the plug connection at the machine. If water got into the plug box, it would cause the electricity to leap to the frame of the coal-cutter.

Mr. A. B. Muirhead, electrical engineer, Glasgow, who was called on behalf of the Banknock Coal Co., said the coal-cutter was installed in a very wet place. One of the three phases on the coal-cutter itself was earthed, apparently through moisture causing sparking from the terminal to the frame of the coal-cutter. There was another leak on the trailing cable almost opposite where the body was lying. From these facts he formed the impression that this cable was made alive and deceased was handling the cable. A formal verdict was returned.

The Electro-Harmonic Society.—The next concert (Ladies' Night) will be held at the Holborn Restaurant (King's Hall), on Monday evening, November 17th, 1913, at 8 o'clock. Mr. S. Z. de Ferranti will preside. The artistes will be as under :—Vocalists: Miss Mabel Manson (soprano); Miss Violet Oppenshaw (contralto); Mr. Charles Saunders (tenor); Mr. Peter Dawson (baritone). Raconteuse, Miss Helen Mar; ventrilcquist, Mr. Tom Edwards; entertainer, Mr. Lindon Wyatt; pianoforte solo, Miss Adela Hamaton. Accompanist, Mr. Bernard Flanders, A.R.A.M.

An Electrical Vehicle Test.—Following the recent example of the Arrol-Johnston Motor-Car Co., in submitting one of their electric cars to a run from Dumfries to London, a distance of nearly 400 miles, a Bailey electric car has lately made the journey from Boston, Mass., to Burlington, Vt., U.S.A., the distance in this case being 258 miles. The actual running time was 13 hours 35 min., equal to an average speed of 19 m.p.h. The 60-cell Edison battery, which was fully charged at the start, was given five "boosts" *en route*, at rates varying from 30 to 150 amperes.

Electrical Vehicles at the Paris Motor Exhibition.—Although there were no examples of the pleasure type of electric motor vehicles at the Motor Car Exhibition just held in Paris, one or two examples of electrically-operated industrial automobiles were to be seen. Among them was an auto-Fram front-wheel-driven chassis made by the Société F.R.A.M. Française, of 47, Boulevard Haussmann, Paris. The electrical equipment, which is carried on a swivelling fore-carriage, consists of a battery of 42 Tudor cells, coupled in series and supplying current to two motors which drive the front wheels through pinions meshing with internally-cut gear wheels. An important advantage of the design is that practically any type of chassis frame and body can be employed. Two 5-ton vehicles were exhibited, one having an ordinary lorry body, while the other was fitted with a roomy steel dust cart body built for the Paris Municipality. The controller on these vehicles is adapted to give five forward positions and one reverse. Messrs. Balachowsky & Caire, of Surasnes, Paris, displayed a railless trolley single-deck omnibus, the electric motors being built up so as to form the hubs of the rear road wheels. This firm also had on view one of its petrol-electric 3½-ton motor lorries. The power is supplied by a 24-H.P. motor direct-coupled to a generator, both being supported on a sub-frame, suspended from the main frame by rubber shock absorbers. The current from the generator is taken to a junction box on the back axle, and thence by two short cables to electric motors contained in the hubs of the rear wheels.

London Electricians' Wages Movement.—Carrying out the intention mentioned in our issue of October 31st, the Electrical Trades Union has sent a circular to all electrical contractors demanding an increase of wages to 11d. an hour, and other improvements in the conditions of service. The Electrical Contractors' Association, being an incorporated body, cannot deal directly with the situation, but is issuing a circular to all contractors convening a meeting for a date early in December, at which the question will be discussed.

The Melun Railway Collision.—Much discussion has been aroused in France with regard to the desirability of improving the systems of signalling, so as to provide effectually against the failure of the human factor which has been manifest in so many railway accidents of late. The *Temps* urges that all passenger trains should be lighted with electricity, so that fire caused by gas may in future be prevented.

Appointments Vacant.—Deputy head of the electrical engineering department of the Victoria Jubilee Technical Institute, Bombay, for five years (Rs. 350 to Rs. 450). Particulars from the office of this journal; see also advertisement pages.

Inquiries.—Makers of the "Universal" storage battery; makers of glass cases for electricity meters; and makers of "Ensign" electric fires, are asked for.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—Before MR. J. BEMROSE left Tunbridge Wells to take up his appointment as chief engineer at Leek, Mr. R. N. Torpy, the borough electrical engineer, on behalf of the staff and employés, took the opportunity of presenting him with a silver chronometer stop watch, suitably engraved, expressing their good wishes. Mr. J. Bemrose suitably responded.

MR. VALENTINE F. BUSH, second assistant engineer, Tunbridge Wells electric supply department, has been appointed assistant engineer to the Scarborough Electric Supply Co.

The Stoke-on-Trent T.C. has appointed MR. S. H. FOWLES, of Dewsbury, as mains superintendent for the southern district of the borough.

The Kendal T.C. has increased the salary of the manager of the electricity works by £15 a year to £175.

The Bridlington T.C. has passed a vote of sympathy with the borough electrical engineer, MR. A. J. BECKETT, in his illness, and expressing a hope that he will soon be restored to good health.

Out of 180 applicants for the post, MR. LIONEL B. HOGARTH, borough electrical engineer at Morecambe, has been recommended for appointment to a similar position at Whitehaven, at a yearly salary of £250.

Tramway Officials.—MR. H. HUGHES having been appointed chief clerk of the Ashton-under-Lyne Corporation Tramways has resigned his appointment on the Walsall tramway manager's staff. The appointment of a successor has been deferred in view of the approaching centralisation of all the clerical work at the Bridge Offices, and in this connection the manager has been empowered to make such arrangements for the reorganisation of his staff as he considers expedient.

General.—The address of MR. C. S. NORTHCOTE is Navaltum, Ltd., Jubilee Place, Chelsea, S.W. (Telephone, "No. 1279 Kensington.") The firm is supplying a patent metal,

MR. J. WILTSHIER, electrical engineer, St. John's Lane, Canterbury, was on Monday re-elected an Alderman on the City Council.

MR. PATON has resigned his position as manager in Scotland for the Electrical Co., Ltd., London, and has taken up an important position with Messrs. Andrews & Co., mechanical and electrical engineers, 198A, St. Vincent Street, Glasgow.

MR. P. J. BOUCHER, who has for some three years acted as traction lamp expert to Messrs. Siemens Bros. Dynamo Works, Ltd., has been appointed to a similar position with the Edison and Swan United Electric Light Co, Ltd., in London.

MR. W. H. MULHALL, who for the past three years has acted as traction lamp expert to Messrs. Siemens Bros. Dynamos Works, Ltd., has been appointed to a similar position with the Edison and Swan United Electric Light Co. He will take over his appointment on December 1st.

MR. W. A. COATES, of Hamilton, Ontario, has just joined the Ferranti Electrical Co., of Canada, as assistant general manager, his duties being those of the chief engineer in Canada. Mr. Coates was in charge of the Switchgear Sales Section for the British Westinghouse Co. until the end of the last year, when he resigned to join the Switchgear Engineering Department of the Canadian Westinghouse Co.

MR. E. BROWN, late contract manager of Blackburn Telephone Exchange, took up his new duties at Nottingham last week. Prior to leaving he was the recipient of a dining room clock and cake stand, the gift of the Blackburn District staff.

MR. D. P. IONIDES, M.I.E.E., is to-day moving into larger offices at 124, St. Vincent Street, Glasgow. His telephone number and telegraphic address are unaltered.

The staff and employés of Siemens Bros. Dynamo Works, Stafford, have presented a silver tea and coffee service to MR. J. F. BROADHEAD, shop engineer, on his marriage, and from the shop engineers he received a case of fish knives and forks.

MR. FREDERICK TURNER GARRETT, J.P., who is the new Mayor of Dunstable, is the principal of the firm of F. T. and A. Garrett, electrical engineers. He entered the Town Council in 1887 as a member of the Beds. County Council, was a borough magistrate, and previously acted as Mayor in 1897, 1898 and 1905.

Obituary.—MR. THOMAS CUSHING.—We regret to record the death, which occurred toward the end of October, at Woodside Green, S.E., of Mr. Thomas Cushing, M.I.E.E., F.R.A.S., at the age of 73 years. In 1863 he was appointed to a junior post in the firm of Messrs. T. Cooke & Sons, of York. This firm made chiefly astronomical instruments at the time, but some instruments of other kinds were manufactured under the head of "scientific instruments." Among these were some of the original telephones. In 1867 an assistant inspector of scientific instruments was required at the India Store Depôt (India Office) and Mr. Cushing was appointed. Upon the retirement of Col. Strange, F.R.S., Mr. Cushing was promoted to the post of Chief Inspector. During the last 40 years the demands of India have increased enormously, and in a like proportion has the work of the inspector of scientific instruments increased. At the time of the retirement of Col. Strange the scientific instruments comprised astronomical, mathematical and physical and sundry other instruments, and little or nothing was known of electrical apparatus. Mr. Cushing was one of those who was able to follow up electrical apparatus from its birth. Beginning with telegraph instruments and sundry small apparatus ordered by India, Mr. Cushing successfully tested and sent out all sorts and descriptions of apparatus, ranging from the above to the 1,400-KW. installation at Ishapur (Marshall-Crompton), 1904/1905. Whether 1,400-KW. machinery can be rightly termed "scientific instruments" or not, the Government title still subsists. Mr. Cushing's figure was a familiar one on the test-beds and in the works of the various large electrical firms throughout the country, when he was not in his office at the India Store depôt. About 1902, Mr. Cushing received an assistant inspector. About this time trouble was caused through the insufficient insulation of a certain long telegraph line in India. Mr. Cushing suggested the use of a new form of insulator, and accordingly an oil insulator was tried. He finally invented an altogether new form of oil insulator, which he patented. This was tried and found successful. Mr. Thos. Cushing became a member of the Institution of Electrical Engineers in 1881. He was introduced by Prof. Carey Foster and seconded by Mr. Alexander Siemens, with whom he was always a great friend. After his retirement Mr. Cushing spent several years on the Continent, and when he returned to England he settled down at Rosslynlee, Woodside. His death occurred at his residence on October 22nd due to liver complaint.

MR. J. SANKEY.—The death recently occurred quite unexpectedly of Mr. J. Sankey, chairman of Joseph Sankey and Sons, Ltd., ironmasters, of Bilston. Deceased gentleman was the eldest of three sons of the founder of the business. He had very large interests in the Midlands. He was only 57 years of age.

MR. ROBERT WYLLIE.—The death occurred suddenly on October 25th at the age of 75 years, of Mr. Robert Wyllie, formerly manager for 22 years of the works of Messrs. N. Greening & Sons, Ltd., wire manufacturers, Warrington.

SIR ROBERT HUNTER.—We regret to record the death which occurred on November 6th, at the age of 69 years, of Sir Robert Hunter, who was for 30 years solicitor to the General Post Office. Sir Robert had for many years been very closely concerned with a host of legal matters, negotiations, agreements, &c., relating to telephone, telegraph, and wireless interests; his duties must have been particularly arduous in recent years, which have witnessed the transfer of the telephones to the State, and Marconi discussions and agreements.

NEW COMPANIES REGISTERED.

Standard Meter Co., Ltd. (131,952).—This company was registered on November 3rd, with a capital of £20,000 in £1 shares, to carry on the business of manufacturers of, and dealers in, gas, electric and water meters and all apparatus and things required for or capable of being used in connection with such meters, electricians, electrical, mechanical and civil engineers, &c. The subscribers (with 100 shares each) are: F. Thorp, Grasmere, Whitefield near Manchester, engineer; H. T. Thorp, Moss Bank, Whitefield, near Manchester, engineer; T. Thorp, Moss Bank, Whitefield, near Manchester, engineer. Private company. The number of directors is not to be less than two or more than five; the first are F. Thorp and H. T. Thorp (both permanent); qualification, £100 shares or stock: remuneration as fixed by the company: solicitor, C. H. Pickstone, Radcliffe Bridge, Radcliffe, Lancs. Registered office, Victoria Works, Narrow Lane, Whitefield, near Manchester.

William Maxwell & Co., Ltd. (132,030).—This company was was registered on November 6th, with a capital of £2,000 in £1 shares (1,000 preference), to take over the business of an electrical and mechanical engineer carried on by W. Maxwell at 204, Goldhawk Road, W. The subscribers (with one share each) are:—A. Docker, 9, Gray's Inn Square, W.C., solicitor; R. P. Glanville, 9, Gray's Inn Square, W.C., managing clerk. Private company. The number of directors is not to be less than two or more than five; the first are W. Maxwell and J. F. Tester (both permanent). Registered office, 204, Goldhawk Road, Shepherd's Bush, W.

Enfield Electric Cable Manufacturing Co., Ltd. (131,995).—Registered November 5th, by Cecil J. Rawlinson & Son, 47, New Broad Street, E.C. Capital, £50,000 in £1 shares. Objects: To carry on the business of manufacturers, merchants, engineers, patentees, agents, manufacturers of, and dealers in, wires, cables and other articles and accessories in the electrical and allied trades, &c. The subscribers (with one share each) are:—F. Flutte, Fontainebleau, Dacres Road, Forest Hill, S.E., merchant; C. C. Rawlinson, 47, New Broad Street, E.C., solicitor. Private company. The first directors (to number not less than three or more than five) are W. Bakewell, F. Flutte, C. H. W. A. Weuste, G. Ziegler and G. J. Andrews; qualification, 500 shares; remuneration, £100 each per annum. Registered office, 47, New Broad Street, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Newcastle-upon-Tyne Electric Supply Co., Ltd.—Trust deed dated October 16th, 1913, to secure £400,000 debenture stock at 5 per cent. per annum, with power for the company on complying with the conditions of the trust deed to issue not more than £100,000 further stock ranking *pari passu* with above amount, charged on electric lighting and power undertakings of the company; certain freehold and leasehold land at Carville, Northumberland, Dunston, Durham; and company's undertaking and other assets, present and future, except uncalled capital (subject to first mortgage debenture stock secured by trust deed dated June 30th, 1909). Trustees: Law Debenture Corporation, Ltd., Threadneedle Street, E.C.

Eastern Telegraph Co., Ltd.—Particulars of debenture stock for an amount not exceeding one-third of the share capital for the amount being issued and paid up, created October 29th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £92,296. Property charged: The company's undertaking and revenue. No trustees.

New Liverpool Rubber Co., Ltd. (109,933).—Return dated October 1st, 1913. Capital, £150,000 in £1 shares (52,000 pref.). 58,502 ord. and 51,410 pref. shares taken up. £58 502 paid on the ord. £51,410 considered as paid on the pref. Mortgages and charges: £25,705. Registered office, 292, Vauxhill Road, Liverpool.

National Conduit and Cable Co., Ltd. (59,251).—Return dated September 17th, 1913. Capital, £1,000 in £1 shares. All shares taken up. £1 per share called up on 7. £7 paid. £993 considered as paid on 993 shares. Mortgages and charges: Nil.

Llangefni Electric Light and Power Co., Ltd. (111,909).—Return dated April 18th, 1913. Capital, £3,000 in 2,750 pref. and 250 ord. shares of £1 each. 2,566 pref. and 250 ord. shares taken up. £2,566 paid on the pref. £250 considered as paid on the ord. Mortgages and charges: £700.

Yale Electric Power Co., Ltd. (60,493).—Return dated October 9th, 1913. Capital, £20,000 in 668 ord. shares of £25 each, and 3,300 pref. shares of £1 each. 668 ord. and 300 pref. shares taken up. £25 per share called up on 600 ord., and £1 per share on 300. £15,300 paid. £1,700 (£25 per share) considered as paid on 68 ord. Mortgages and charges: Nil.

South American Light and Power Co., Ltd. (74,446).—Return dated August 5th, 1913. Capital, £200,000 in £1 shares. 179,400 shares taken up. £122,407 paid. £49,993 considered as paid. Mortgages and charges: £150,000.

CITY NOTES.

West India and Panama Telegraph Co., Ltd.

The directors' report for the half-year ended June 30th, 1913, after regretting the death of Mr. Henry Holmes, who had been a director of the company since 1874, says that the accounts show that the amount to credit of revenue is £45,524, against £46,718 for the corresponding half-year of 1912, and the expenses have been £26,260, against £27,109. The result is a balance of £19,263, plus £1,879 interest on investments and £2,435 brought forward, making £23,578. The directors have placed £2,000 of this to reserve, leaving an available balance of £21,578. They recommend:—First preference shares dividend, six months to June 30th, 6s. per share, £10,368; second preference shares dividend, six months to June 30th, 6s. per share, £1,400; ordinary shares, 1s. 6d. per share (free of income-tax), £6,624; balance to current half-year's account, £3,184. The traffic receipts show a decrease of £1,084, as compared with the corresponding period. The expenses of repairing cables were £7,759 as compared with £8,611. In July a contract was entered into with Messrs. Siemens Bros. & Co. for the manufacture of 150 knots of cable for stock, which have since been delivered in the West Indies. The Imperial and Canadian Governments, having brought pressure to bear on the company for a general reduction of West India rates, the directors have found it necessary to reduce the rates in return for subsidies on certain conditions. A formal deed to give effect to the agreement is in course of negotiation and will have to be submitted to Parliament.

Continental.—Switzerland.—The balance-sheet of the Compagnie de l'Industrie Electrique et Mecanique, of Geneva, for the last financial year, shows a loss of £4,370, reduced to £3,481 by the amount brought forward from the previous year, when a dividend of 4 per cent. was declared. A net profit of £43,246 is reported by the Société des Usines Electriques de la Lonza, of Basle, out of which a dividend of 5 per cent. is being paid.

France.—A new company has lately been formed in Paris with a capital of £40,000, and the title La Compagnie Haut Marnaise d'Electricité, to acquire a small central station at Roches-Sur-Rognon, and to undertake the electric lighting of a number of small towns in the district.

The Berliner Elektromobilfabrik Gesellschaft, of Berlin, is apparently meeting with an increased demand for its vehicles, as it just been decided to increase the capital of the concern from £7,500 to £12,500.

Paris Tramway Finance.—The Paris General Omnibus Co., which secured, through its new agreement with the Municipal Council, the control or ownership of almost the whole of the motor-omnibus and tramway traffic of the city, has decided to increase the share capital from £3,200,000 to £4,000,000 by the issue of 40,000 new shares of £20 nominal. These are to be offered at the price of £24, and existing proprietors have a preferential right of subscription in the ratio of one new share to four old shares. It has also been resolved to strengthen the working capital by the emission of debentures up to the amount of £800,000. The proceeds of the issues are to be devoted to the acquisition of further motor-omnibuses and the reconstruction of sections of tramways by the substitution of the underground for the overhead system, or by the introduction of the central conduit in place of the side conduit.

Prospectuses.—*Rangoon Electric Tramway and Supply Co., Ltd.*—The list opened on Monday and was to close on Wednesday, in an offer of £100,000 5 per cent. mortgage debenture stock at 98. The issue has been made to provide additional capital required to meet the demands of the business and to carry out extension works.

United Electric Tramways of Monte Video, Ltd.—A circular has been issued to the existing preference and ordinary shareholders, offering 10,000 6 per cent. cumulative preference shares of £5 each at par, and 19,800 ordinary shares of £5 each at par, the capital being required in order to cope with the natural growth of the company's business, as explained at the last meeting. (See Elec. Rev., June 20th, 1913.)

Amazon Telegraph Co., Ltd.—The report of the directors for the year ended June 30th, 1913, states that the gross revenue amounts to £105,666, and the working expenses to £59,091. After providing £22,917 for debenture interest and sinking fund and carrying £10,000 to the general reserve and £2,500 to the reserve for the renewal and maintenance of cable steamers, the directors recommend the payment of a dividend of 4½ per cent., free of income-tax, on the share capital, leaving £5,571 to be carried forward.

Stock Exchange Notices.—The Committee has ordered the undermentioned security to be quoted in the Official List:—

North Metropolitan Electric Power Supply Co.—£200,000 6 per cent. cumulative preference stock.

Application has been made to the Committee to appoint a special settling day in—

City of Las Palmas Water and Power Co., Ltd.—Provisional scrip certificates fully and partly (40 per cent. paid) paid, for £237,000 5 per cent. first mortgage debenture stock.

Japan.—The Keihan (Kyoto-Osaka) Electric Tramway Co. is declaring a dividend of 6½ per cent. for the last financial half-year.

The Toyooka Electrical Light Co., of Hyogo, is increasing its capital from £15,000 to £25,000.

The Minoms Electric Tramway Co. has declared a dividend of 7 per cent. for the last financial year.

The New British Ever-Ready Co., Ltd.—The directors have declared the first interim dividend at the rate of 7 per cent. on the 7 per cent. cumulative preference shares (participating in further profits up to 10 per cent.) for the period ending September 30th, the dividend to be payable on December 1st.

Joseph Sankey & Sons, Ltd.—The recent issue of 100,000 7 per cent. preference shares was subscribed more than twice over, and the books were closed on the 7th inst.

Richard Johnson, Clapham & Morris, Ltd.—Interim dividend of 9d. on the ordinary shares for the half-year ended September (7½ per cent. per annum).

Cape Electric Tramways, Ltd.

The seventeenth ordinary general meeting was held on November 5th, at the offices, London Wall Buildings, E.C., Mr. L. Breitmeyer presiding.

The Chairman, in proposing the adoption of the report (see *Electrical Review*, page 671), said that no startling incidents had occurred to interrupt the even tenor of their way during the past year. Since the end of their fiscal year, however, a serious labour disturbance broke out at Johannesburg, which left its mark on the whole of South Africa. A general strike throughout the country was, however, averted, but even if one had taken place he thought they could have counted upon the loyalty of their men. The twelve months under review had shown a steady development both in Cape Town and Port Elizabeth, which was the best possible condition for securing to the shareholders a continued dividend. Last year he had the pleasure of informing them that they had increased their traffic by nearly a million passengers and their receipts by about £8,000 beyond those of the previous year. This year he was gratified to state that those figures had again been topped, inasmuch as they had carried 1½ million more passengers with an increase in receipts of about £12,000. The number of passengers carried last year was 18,935,000, and when the company started in 1898 they only carried nine million, which showed that they had doubled their traffic. Unfortunately the operating expenditure kept pace with the increased revenue, to which fact he drew their attention at the last annual meeting. They paid a higher rate of wages, the price of coal had gone up, and the age of the plant was also responsible for the heavier costs of the upkeep. Those were conditions to which their managers in Cape Town and Port Elizabeth must submit, although they exercised the strictest economy in all departments. Last December, at the request of the board, Mr. Bommel, the managing director of the company, paid a visit to South Africa, and spent some time in going through the details of the working of the systems of Cape Town and Port Elizabeth. As a result of his investigations they were making considerable additions to the rolling stock of both systems, and were increasing the power at Port Elizabeth by another unit of 500 kw. That policy really meant reapplying their reserve funds in a far more profitable manner for the benefit of shareholders by increasing the carrying capacity of their systems, and they were bound to keep their plants in the highest state of efficiency if they wished to continue their pleasant position with the inhabitants of Cape Town and Port Elizabeth and retain their goodwill and patronage. Up to now, the first quarter of the current year—from the 1st July to 30th September—showed an increase in receipts of £2,890, as against the similar period in 1912, and he had every reason to anticipate that such proportionate increase would be maintained. They would remember his remarks last year upon the motor omnibus service with which they were making trials. He could not yet give their full information and their final experience on the subject. That enterprise was still in the experimental stage, but they had gained sufficient knowledge to convince them that for the regular town service in Cape Town those 'buses, under present conditions, were not required. A service to the docks, where they possessed no tram line, had shown poor results, and they intended to discontinue it if it was not better patronised by the public. As far as they could see those motor 'buses answered well on suburban districts as feeders for their tramway system and also for pleasure traffic on the Victoria road and other routes round the peninsula. They were quite alive to the necessity of increasing their business in all directions, and were constantly on the look out for the promotion of ventures which came under the legitimate scope of their transportation business. Those of them who were connected with South Africa might have heard that they had bought the Royal Hotel, Hout Bay. It was being reorganised and placed under the management of the Peninsula Excursions Company, and they expected from this enterprise the best results both for them and also for the Cape Town public.

Admiral Sir A. H. Markham, K.C.B., seconded the motion, and the report was adopted.

Edison & Swan United Electric Light Co., Ltd.

The thirtieth ordinary general meeting of the shareholders of the above company was held on Tuesday at Winchester House, Old Broad street, under the presidency of Mr. C. J. Ford.

The Chairman, in moving the adoption of the report (see page 757), said that the position of affairs as disclosed by the balance sheet was, at the first blush, very disappointing, but when they came to fully consider the circumstances which had led up to the result, it was not as bad as it appeared to be. The company expended about seven or eight years ago a sum of approximately £30,000 in laying down plant for the original type of metal filament lamp, known in the trade as the pressed lamp. About two years ago this type was to a great extent superseded by the drawn wire lamp, and it became necessary for the company to expend a large sum upon additional plant for the purpose of manufacturing that lamp. Shortly after the commencement of manufacture it was intimated by the owners of certain patents that the process of manufacture employed by the company was an infringement of their rights. As a consequence the manufacture of those lamps was suspended, and when he (the chairman) joined the board negotiations were entered into with the parties in question with a view to coming to some amicable arrangement under which the company should have the right of manufacturing those lamps under a licence. They would readily realise that a matter of this importance must necessarily take some time to carry out, and it was not until some time in July that the matter was finally settled. That being so, the sales of lamps for the whole of last winter were very greatly interfered with, and that fact alone had had the effect of largely reducing the sales for the period under review. The revenue account for the year had also suffered by the absence of the dividend which had hitherto been received upon the shares which they held in the Altrincham Electric Supply Ltd. That company at the close of its financial year at the 31st December last, showed a profit which would have enabled a dividend of seven per cent. to have been declared as heretofore, but at that time it was exceedingly short of funds in consequence of the heavy outlays which had been made upon new plant to cope with its rapidly extending business. As chairman of the Altrincham Company he felt that it would be financially unsound to distribute that profit under the circumstances, as the requisite money would have had to be borrowed for the purpose, and in his view it would have been a mistake to have depleted the Altrincham Company of money which it badly wanted for other purposes in order to pay a dividend upon its shares—the whole of which would practically have come into the pockets of the Edison and Swan Company. If the dividend had been paid it would have amounted to the substantial sum of £2,300. He was glad to tell them that further capital had since been provided for the Altrincham Company by the issue of additional debentures, and, as far as he was able to judge, there was no reason whatever why dividend payments should not be resumed for the current year. They would see from the report that a revaluation had been made of certain of the assets, particularly with regard to the lamp stocks, and those were now brought down to a figure as near as they could get to present manufacturing cost, which had recently been materially reduced. The reserve fund, amounting to £45,000, had been applied to meet that and other depreciated values. A further £3,013 taken out of the balance brought forward from last year had been applied as special depreciation, making a total of £48,013. The Benwell works were finally closed in March last. They were used for the manufacture of lamps of the carbon type, and the whole of the work carried on there had been transferred to their Ponders End works. Loans figured in the balance sheet at the sum of £20,000, secured by the deposit of some of their own debenture stock and £25,000 debentures in the Altrincham Electric Supply, Ltd. When he joined the board, of those loans £14,000 was due to the company's bankers, who held as security the Altrincham debentures and £50,000 second debenture stock of the company. He was glad to say that since the date of the balance sheet this loan had been repaid and the Altrincham deebntures and their own second debentures freed—the loans now standing at only £8,000. To enable them to do that they had disposed of the Altrincham debentures as it was necessary after paying off the loan in question to provide further funds for carrying on the business of the company. In this year's balance sheet they had split up the figures previously shown under the heading of stock and plant into three headings as follows:—Fixtures, fittings and office furniture, £4,456 11s. 3d.; plant and machinery, £78,986 16s. 8d.; and stocks on hand, £152,404 2s. 1d.; making a total of £235,847 10s. as against £267,341 3s. 4d. last year. He was glad to say that very large economies had been made in expenditure without loss of efficiency, and he was sure they would agree with him that this was a move in the right direction and must materially improve the position of the company during the current year. Amongst other reductions they would be glad to hear that there was a considerable saving in the fees paid to the directors, and they had also made a considerable saving by removing the whole of their stores and clerical staff from the city to the works, and in connection with this they were giving up their showroom and stores at College Hill. He noticed in a Press comment dealing with the report and accounts it was pointed out that at a meeting of the debenture-holders held in June he stated that economies had been instituted which at that time amounted to £6,000 per annum, and he was asked how it was in spite of these economies the showing was so disappointing. His answer was that he only joined the board in March and it naturally took him some little time to become acquainted with the intricacies of the company's business. The making of economies required very serious consideration in order that no loss of efficiency was brought about, and it was therefore towards the close of their financial year that these economies were brought into being, and naturally the present accounts received practically no benefit whatever from them. He made the statement in question at the debenture-holders' meeting on June 18th, and the accounts before them only carried them to June 30th. Since that date, however, additional economies had been made, bringing the total up to the large figure of £10,000 per annum. The lease of 123-125, Queen Victoria street had been acquired, and he thought the advertisement they would receive when they occupied these premises would be a very valuable one. After taking into account the revenue

which they expected to receive from letting the Queen street premises, of which they had a long lease, and the saving from closing down College Hill and the printing office, they would not stand at a higher rent than hitherto. They were looking for a considerable access of sales as they had thoroughly reorganised the sales department, which was badly in need of it, and had appointed a gentleman as sales manager who had had a very large experience in this direction gained with some of their competitors. In order to provide themselves with very necessary funds they had disposed of the Altrincham debentures, and it might be that if the business expanded as they had every reason to expect it would, they might have to dispose of part or all of their Altrincham shares to provide further capital. The Altrincham Co. were doing exceedingly well and the board were not anxious to make a sale until it was absolutely necessary, as they felt that the longer these shares were held the more valuable they were likely to become. Messrs. C. E. Hunter and E. Gimingham had been elected directors, and this step had proved of the greatest benefit to the company. Mr. Hunter for many years had been in charge of the fittings and general manufacturing side of the works, and Mr. Gimingham had occupied a similar position in connection with the manufacture of lamps, and, under the powers of the articles, the board elected them as technical directors. For a considerable time the company had not entered upon any large scheme of advertising, and undoubtedly their sales had very much fallen off by reason of this. They had now taken steps to bring their goods prominently before the public by posters. He felt he must refer briefly to the scheme which was submitted to the debenture-holders last June with the object of providing a considerable amount of working capital. It was not carried through as the debenture-holders did not think it was favourable to them. They might take it that if the debenture-holders objected to it on that ground the scheme was undoubtedly one favourable to the shareholders. For his own part he was fully convinced it was favourable to both classes. It was difficult to carry on a business of such magnitude as theirs unless they had ample funds, and in framing that scheme apparently there was no other alternative for providing a really substantial and adequate amount. Some of the shareholders adversely criticised it on the ground that a call of £1 per share was proposed to be made upon them. That undoubtedly was from their point of view very material, but it had the effect of putting the company in a strong and profit-earning position and he thought it was fully justified. He noticed that in some quarters attention had been drawn to the fact that the item in the balance sheet of £390,000 for cost of establishing the business, goodwill, etc., remained the same as last year, and it had been suggested that some steps should be taken to reduce this. He entirely agreed with this view, but the difficulty was, how it was to be reduced. That could only be done by a reduction of capital which in their case presented more than ordinary obstacles. If the whole of their shares were fully paid, it would not present insuperable difficulties, but if they were to bring forward any scheme for materially reducing that item, and he thought they would agree with him that if it was to be done there was no good tinkering with it, it would mean that an amount would have to be written off the partly paid "A" shares which would practically leave them with very little else but the present liability of £2 upon them, and no doubt the majority of the shareholders would strenuously oppose any such step. In conclusion he might say the board were very hopeful as to the future prospects, and they were looking for a very distinct improvement during the current year. They must not look, however, for an early resumption of dividends, as before that could happen, he thought they would agree it was absolutely essential that they should build up a substantial reserve fund. If they had at their disposal the sum likely to have been produced by the call on the shares to which he had before referred to, any profit earned would have been available for dividend, but as it now was they must provide the very necessary further working capital out of future profits, as the sum which would be produced if they sold the Altrincham shares might not by itself be sufficient. Had they the money now, they should be in a position to increase their advertising and put down additional plant, both of which operations would increase their business.

Mr. Ellice-Clark seconded the motion.

Mr. E. B. Parsons said he would like to know whether the company now possessed a proper technical staff. Looking back it seemed to him that a great deal of the trouble from which they had suffered was because they had not had a proper technical staff at the works, and consequently they had not been able to keep ahead of their competitors.

Mr. F. J. Rogers asked the chairman whether he could make any definite statement as to the intention of the board in regard to making a call upon the ordinary shares on which there was a liability of £2.

Mr. Lock said he thought they had reason to congratulate themselves that in Mr. Ford they had a chairman of the calibre he had shown himself to possess. He (the speaker) was satisfied that the business was now in strong, capable and energetic hands. With regard to the necessity for a technical staff he rather differed from Mr. Parsons because he was given to understand by gentlemen connected with the trade that in the two new directors—Mr. Hunter and Mr. Gimingham—they had technical men of a high order who would be able to render the company very valuable service in the future. What they had suffered from had been the antiquated method of manufacture of lamps and lack of working capital and the troubles they had had with the patentees. That trouble had now been smoothed over, and he hoped and trusted that the manufacture of the new wire-drawn lamps would be carried on without any obstruction on the part of competitors and also in the most economical manner possible. He would like the chairman to tell them whether their stock had been adequately dealt with by the special depreciation, and whether there was any more depreciation of that character which would have to be dealt with in the future. It was very satisfactory to find that the economies which had been introduced represented the substantial sum of £10,000, which saving he took it would go on year after year. With regard to the Altrincham shares he hoped that the board would not have to dispose of them, as with the growth of the town and the earning capacity of the business, it seemed to him that the value of the shares was likely to go on increasing. Should the board be obliged to sell them rather than they should be sacrificed to any outside purchaser, he hoped the shareholders of Edison and Swan would be given their refusal.

The Chairman, in reply, said that as Mr. Lock had remarked it was perfectly true that in Mr. Gimingham and Mr. Hunter they had two of the most capable men in the electrical trade, and since they had been on the board they had been of the utmost assistance to him and his colleagues. With regard to inventing new lamps, of course they were taking steps to discover something better than the existing lamp. All the electrical manufacturers were doing the same thing—they were all experimenting daily, but none of them had yet hit upon anything extraordinarily new. They had produced what was known as a half watt lamp. Up to the present it was not on the market, but it was very satisfactory as far as it had gone. It was a lamp which if it was brought into commercial use would enormously reduce the expenditure on current. With regard to any call on the shares, that could not be done without the consent of the debenture-holders, as the whole of the uncalled capital was part of their security. The holders of the debentures refused the scheme which the board brought forward some months ago, and he could only now say that they were not proposing to bring forward any scheme which would make a call likely. Mr. Lock had suggested that the £10,000 economies which had been effected would go on from year to year. He (the chairman) would like to point out that what he intended to convey on that point was that they had saved £10,000 upon expenditure which they could do without, but if they were going to push the business they must spend money on doing it. They were making economy on one side on expenditure which he considered was to a great extent quite useless, and they were replacing that partly by expenditure which he hoped would be of a most fruitful nature to the company. They were spending money on advertising, they had got a new sales manager, and they were putting on new travellers. As to the Altrincham shares, he quite agreed with Mr. Lock that they were very valuable. The company was operating in a district which was growing very quickly, and it was likely that the shares would increase very materially in value. They would not part with those shares unless they were absolutely forced to, but if they were going to push the business properly they must have money, and that was one of the sources from which they could obtain it. Personally, should they have to sell these shares, he would be quite willing to offer them to their present shareholders, but his experience had taught him that if they were to do so the probability was that only about £5,000 would be taken up, and if such a thing should happen it would seriously prejudice them when they came to offer them *en bloc* subsequently. With regard to the special depreciation, the amount they had written off absolutely cleared the board and the stock had been written down to absolutely bed-rock.

The report was adopted.

Buenos Ayres Lacroze Tramways Co., Ltd.—The report for the year ended June 30th last states, says the *Financial Times*, that the gross receipts amounted to $6,162,305 legal currency, against $5,650,827 obtained for the preceding year, an increase of $511,477. The working expenses amounted to $3,839,729, an increase of $361,748, leaving $2,322,575 as net receipts of operation, plus $115,380 as interests and discounts, making a total of $2,437,956 legal currency. After deducting the difference in exchange, interest on debentures, fund providing for accidents, amortisation of municipal concession and other outlays, such as preliminary expenses, expenses of issue and payment of roadway, there remains a balance available of $1,708,019, which, together with $24,917 brought forward, makes a total of $1,732,937 legal currency, which the directors propose to distribute as follows:—5 per cent. to the reserve fund, $85,400; 5 per cent. to the directors, $85,400; ½ per cent. to the auditor, $8,540; extraordinary expenses, $28,134. To the special fund for renovations—Permanent way, overhead line and cables, $150,000; buildings, machinery, rolling stock, &c., $100,000; to the shareholders (5 per cent.), $1,250,000; carrying forward $30,460. Thus the shareholders will receive the sum of $1,250,000, against $1,125,000 distributed last year.

STOCKS AND SHARES.

Tuesday Evening.

This week has brought a new account to the Stock Exchange, but no further influx of business. Mr. Asquith's speech at the Guildhall on Monday night was reassuring, so far as it went, with regard to Mexico; but, on the week, there are falls in most of the Mexican securities. Of course, these falls are, in the majority of cases, merely nominal markings, especially as regards the selling prices. Because a stock happens to be quoted 57½ to 62½, it does not follow by any means that a man who wished to realise would get 57½ for it. On the other hand, were a buyer of any substantial amount to come into the market, he would probably be able to secure only a small quantity at 62½. This gives some idea of the extremely nominal character of quotations, which, by the way, is not confined in every case to Mexican issues.

From the Stock Exchange point of view, an important event of the week has been the publication of the Committee's findings in connection with the introduction of American Marconi shares to the market in April, 1912. The subject has been so well ventilated in the daily papers, that no more need be said as to the details of the business, beyond noting that the Committee have passed a resolution strongly condemning the manner and method of the introduction of these shares in the Stock Exchange, adding that all introductions of this character will render members concerned in them liable to be dealt with under Disciplinary Rules.

One effect of the American Marconi affair has been to depress the price of Marconi shares, which show a fall of 1/6 on the week, the company's Preference shares also participating. Americans and Canadians remain a dull market. It is to be devoutly hoped that the last has been heard of this unhappy affair, the extraordinary part about which seems to be that nearly everybody who was at all intimately connected with the Marconi agreement got into some trouble or other. The only people who appear to have made any substantial capital out of it are the politicians. And the capital in their case is not of the bank-balance variety.

The Electric Lighting market is steady, without calling for special notice. Money remains dear. Every week the Bank of England escapes by a miracle the raising of the Rate; and if Lombard Street gets through the year with a 5 per cent. minimum, it will be a wonderful performance. This uncertainty with regard to money reacts upon all investment securities. Charing Cross City Preference went back to 3¾. Metropolitan Ordinary lost another ¼, and London Electric Debenture stock drooped.

The Home Railway market has again suffered sharply from a small amount of liquidation and a complete want of confidence on the part of the public. Steam stocks went down with a run, recovering, however, from the lowest. In sympathy with this weakness, Metropolitan Consolidated fell back to 38⅞, subsequently improving to 39. Districts at 28 are also ¼ down, following upon their fall of 3½ last week. Underground Electric "A" shares braced up to 10s. 7½d., a rise of the pence. City and South London Preference stocks are flat, the two senior issues both losing two points, while the 1901 and 1903 stocks fell 1. A similar loss took the company's 4 per cent. Debenture stock to 91, which is some 7 points lower than Central London 4 per cent. Debenture. British Electric Tractions have weakened, the 6 per cent. Preferred at 12 showing a fall of 1½, while the 5 per cent. Debenture stock has lost another point at 90½. London United Tramways 4 per cent. Debenture is down 1.

In the Mexican division, the chief flatness is a drop of 16½ points in Monterey 5 per cent. first Mortgage Debenture, which has lowered the price to 54½. The decline, therefore, has been 21 points in less than a fortnight. Mexican Light and Power Company stocks have again given way sharply. The Common and 7 per cent. Preferred shares are both 5 lower at 47 and 77½ respectively; while the first Mortgage 5 per cent. Bonds weakened to 73½. Vera Cruz Debenture stock fell 1, but Mexico Trams are better, the price, after dropping to 72, bracing up to 76. This group, as a whole, shows weakness. Montreals fell 2½, Shawinigan Capital stock 2, British Columbia Deferred and Preferred 3½ each, and Rio Tramway bonds of both classes have lost ½.

The news from Mexico is obviously still grave, each cable adding one or more picturesque details to the tales of chaos, financial and military, prevailing in the country. Where it is all going to end nobody can tell; but a few brave—or rash—spirits maintain that there are fortunes waiting for the capitalist who will buy some of the better-class utility stocks and hold them until the tide turns, taking the risk of whatever damage that same tide may do before it begins to ebb.

There was a rumour current the other day to the effect that the Brazilian Traction Company was about to issue fresh capital, and on this the shares fell to 84. Upon its contradiction there was a recovery to 86, which leaves the price 1½ up on the week. The Anglo-Argentine group is steady. Para Electric Ordinary have started to regain part of their loss; and the feature in this market has been a rise of ½ in Rangoon Preference and of 3 in the company's 4½ per cent. first Debenture stock. Cape Electric Trams are a little easier.

The only movement worth remark in the Telegraph and Telephone section are those in Marconi shares, to which reference has been already made. American Telephone and Telegraph issues are lower, in consequence of dear money and the continued fear that President Wilson may be inaugurating before long a campaign against the Trusts. West India and Panama Telegraphs lost 1/8. Reuters are nominally easier at 9½, and there the list of changes comes to an end.

Manufacturing shares are almost as quiet. General Electric Preference rose ¼ to 10½, and Crompton Debenture put on a point. Willans & Robinson 4 per cent. "B" Preference stock is quoted at 8-13, which is a gain of several points. British Aluminium Ordinary again fell 3/32, this taking them down to 1 3/32. Edison and Swan fully paid £5 shares dropped 10s., to the level sovereign. The rubber market shows considerable strength, in consequence of a rise in the price of the stuff to 2s. 4½d. per lb. Most of the leading shares are better on the week, and a fair amount of money has been put into the market during the past 10 days by investors who are paying for their shares at the current Stock Exchange settlement.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, November 12th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric .. .. per cwt.	5/-	..
a " Nitric .. .. .. "	22/-	..
a " Oxalic .. .. .. per lb.	3d.	..
a " Sulphuric .. .. .. per cwt.	5/6	..
a Ammoniac Sal .. .. .. "	42/-	..
a Ammonia, Muriate (large crystal) per ton	£30 10	..
a Bleaching powder .. .. .. "	£6 5	..
a Bisulphide of Carbon .. .. .. "	£18	..
a Borax .. .. "	£17 10	..
a Copper Sulphate .. .. .. "	£24	..
a Lead, Nitrate .. .. .. "	£30	..
a " White Sugar .. .. .. "	£28	10s. inc.
a " Peroxide .. .. .. "	£89	..
c Methylated Spirit .. .. .. per gal.	2/6	..
a Potassium, Bichromate, in casks per lb.	8¼d.	..
a Potash, Caustic (88/90 %) .. per ton	£22 10	..
a " Chlorate .. .. .. per lb.	3½d.	..
a " Perchlorate .. .. "	4½d.	..
a Potassium, Cyanide (98/100 %) .. " (for mining purposes only)	7½d.	..
a Shellac .. .. per cwt.	92/-	8s. dec.
a Sulphate of Magnesia .. .. per ton	£4 10	..
a Sulphur, Sublimed Flowers .. "	£8 10	..
a " Recovered .. .. "	£5 10	..
a " Lump .. .. .. "	£5	..
a Soda, Caustic (white 70/72 %) .. "	£10 5	..
a " Chlorate .. .. .. per lb.	3½d.	..
a " Crystals .. .. .. per ton	£3 5	..
a Sodium Bichromate, casks .. per lb.	3d.	..
METALS, &c.		
b Aluminium Ingots, in ton lots .. per ton	£96	..
b " Wire, in ton lots (1 to 14 S.W.G.) "	£121 6 8	..
b " Sheet, in ton lots .. "	£126	..
p Babbitt's metal ingots .. .. "	£50 to £221	..
c Brass (rolled metal 2" to 12" basis) per lb.	7⅞d.	¼d. dec.
c " Tube (brazed) .. .. "	9⅜d.	1d. dec.
c " " (solid drawn) .. "	8⅜d.	1⅛d. dec.
c " Wire, basis .. .. .. "	7⅝d.	¼d. dec.
c Copper Tubes (brazed) .. .. "	10¼d.	⅛d. dec.
c " " (solid drawn) .. "	10⅛d.	⅛d. dec.
g " Bars (best selected) .. per ton	£86	£5 dec.
g " Sheet .. .. .. "	£86	£5 dec.
g " Rod .. .. "	£86	£5 dec.
d " (Electrolytic) Bars .. "	£74	£4 10 dec.
d " Sheets .. "	£92	£4 10 dec.
d " Rods .. .. "	£79 10	£4 10 dec.
d " " H.C. Wire per lb.	9⅜d.	½d. dec.
f Ebonite Rod .. .. .. "	4/6	..
f " Sheet .. .. .. "	4/-	..
n German Silver Wire .. .. "	1/10	..
h Gutta-percha, fine .. .. "	7/6	inc.
h India-rubber, Para fine .. .. "	8/4	2d. inc.
f Iron Pig (Cleveland warrants) .. per ton	49/7	2/4½ dec.
f " Wire, galv. No. 8, P.O. qual. "	£14	..
g Lead, English Pig .. .. .. "	£20 5	10s. dec.
m Manganin Wire No. 28 .. .. per lb.	6/6	..
g Mercury .. .. .. per bot.	£7 5	..
e Mica (in original cases) small .. per lb.	6d. to 8s.	..
e " " " medium "	8/6 to 6/-	..
e " " " large .. "	7/6 to 11/-	..
o Nickel, sheet, wire, &c. .. .. "	3/6 to 4/6 nom	..
p Phosphor Bronze, plain castings "	1/1 to 1/8½	..
p " " rolled bars & rods "	1/0⅝ to 1/2⅝	..
p " " rolled strip & sheet "	1/2½ to 1/5½	..
o Platinum .. .. per oz.	185/-	..
d Silicium Bronze Wire .. .. per lb.	11d.	..
r Steel, Magnet, in bars .. .. per ton	£55	..
g Tin, Block (English) .. .. "	£183 to £184	£5 dec.
n " Wire, Nos. 1 to 16 .. .. per lb.	2/6	..
p White Anti-friction Metals .. per ton	£44 to £106	..
k Zinc, Sh's (Vieille Montagne bnd.) "	£25 10	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
k Bolling & Lowe.
l Morris Ashby, Ltd.
m Richard Johnson & Nephew, Ltd.
n W. T. Glover & Co., Ltd.
o P. Ormiston & Sons
p Johnson, Matthey & Co., Ltd.
r W. F. Dennis & Co.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations Nov. 11th.	Rise + or Fall	Present Yield p.c.
	*	1912.	1913.			£ s. d
Bournemouth & Poole, Ord. ..	10	6	5†	9¼ — 10¼	..	5 17 1
Do. 4½ % Pref.	10	4½	4½	8¾ — 9¾	..	4 14 9
Do. Second 6 % Pref.	10	6	6	10 — 10⅝	..	5 14 3
Do. 4½ % Deb. Stock	Stock	4½	4½	96 — 98	..	4 11 10
Brompton & Kensington, Ord. ..	5	10	9†	8¾ — 9	..	5 11 1
Do. 7 % Cum. Pref.	5	7	7	8¼ — 8⅝	..	4 1 2
Central Electric Supply, 4 % Guar. Deb.	100	4	4	93 — 96	−1	4 3 4
Charing Cross, West End & City	5	5	5†	4¾ — 5	..	5 0 0
Do. 4½ % Cum. Pref	5	4½	4½	3⅞ — 4⅛	..	5 2 10
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4	+ ⅛	5 12 6
Do. Do. 4 % Deb.	100	4	4	90 — 92	..	4 7 0
Chelsea, Ord.	5	5	4†	4⅜ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	94 — 97	..	4 12 9
City of London, Ord.	10	9	6†	15⅞ — 16⅛	..	5 7 6
Do 6 % Cum. Pref.	10	6	6	12½ — 13⅝	..	4 8 11
Do. 5 % Deb.	Stock	5	5	116 —120	..	4 3 4
Do 4½ % Second Deb. ..	100	4½	4½	99 — 101	..	4 9 1
County of London, Ord.	10	6	5†	11½ — 12	..	5 0 0
Do. 6 % Pref.	10	6	6	11½ — 12	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	102½—104½	..	4 6 2
Do. 4½ % Second Deb. ..	Stock	4½	4½	96 — 99 xd	..	4 11 0
Edmundson's, Ord.	£3	..	..	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref. ..	5	6	6	4 — 4½	..	8 8 7
Do. 6 % Non-Cum. Pref. ..	5	..	..	1⅜ — 1⅝	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	80 — 88	..	5 8 5
Folkestone	5	6	6	4⅜ — 4⅞	..	6 3 1
Do. 5 % Cum. Pref.	5	5	5	4⅜ — 4⅞	..	5 2 7
Do. 4½ % First Deb.	100	4½	4½	89 — 91	..	4 19 0
Hove	5	9	8†	7⅞ — 8⅛ xd	..	5 10 9
Kensington & Knightsbridge, Ord.	5	8	8†	7⅛ — 8	..	5 0 0
Do. 4 % Deb.	Stock	4	4	88 — 91	..	4 7 11
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	74 — 78	..	5 15 5
London Electric, Ord.	3	2½	..	1⅛ — 1⅜	..	4 12 7
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	..	5 17 1
Do. 4 % First Mort. Deb. ..	Stock	4	4	89 — 92	−1	4 7 0
Metropolitan	5	4	4†	3¼ — 3⅜	− ⅛	5 10 4
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅜		4 17 4
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	96 — 99	..	4 10 1
Do. 3½ % Mort Deb.	Stock	3½	3½	79 — 82	..	4 5 4
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 — 102	..	4 18 0
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	10 — 10⅜	..	5 11 7
Oxford	5	7	6†	6 — 6½	..	5 7 8
St. James' and Pall Mall, Ord. ..	5	10	10†	8⅜ — 9⅛	..	5 8 1
Do. 7 % Pref	5	7	7	6⅝ — 7	..	5 0 0
Do. 3½ % Deb.	100	3½	3½	82½ — 86½	..	4 1 10
South London, Ord.	4	5a	..	2¾ — 3⅛	..	7 0 9
Do. 5 % First Mort. Deb. ..	100	5	5	96 — 99	..	5 0 0
South Metropolitan, 7 % Pref. ..	1	7	7	1⅜ — 1⅝	..	6 1 3
Do 4½ % First Deb. Stock ..	100	4½	4½	93 — 96	..	4 13 9
Urban, Ord.	£1	Nil	..	⅜ — ⅝	..	..
Do. 5 % Cum Pref.	5	3	..	2⅜ — 2⅝	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	83 — 86	..	5 4 8
Westminster, Ord.	5	10	10†	8½ — 8⅞	..	5 14 8
Do. 4½ % Cum Pref.	5	4½	4½	4⅝ — 5	..	4 10 0

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6†	4⅞ — 5⅛	..	5 17 1	Monterey Rly., Light & Power, 5 % 1st Mort. Deb.	100	5	5	52 — 59	− 15½	8 9 6
Calcutta, Ord.	5	1½	..	7½ — 7⅝	..	5 9 8	Montreal, Lt., H. and Power ..	$100	9	10†	210 —215	−2½	4 13 0
Do 5 % Pref.	5	5	5	5 — 5⅛	..	4 15 3	Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5a	£a	15 — 25 xd	..	..
Calgary Power, 1st Mort. Bds. ..	100	5	5	91 — 93	..	5 7 6	River Plate, Ord.	Stock	10	..	207 —217	..	4 8 0
Canadian Gen. El. Com.	$ 50	7	7†	104 —106	−1	6 8 5	Do. 6 % Non-Cum. Pref. ..	Do.	6	6	99 —104 xd	..	5 15 5
Do. 7 % Pref	$100	7	7	117 — 122	..	5 14 9	Do. 5 % Deb. Stock	Do.	5	5	97½ — 99½	..	4 19 6
Cordoba Lt., Power and T., Ord.	1	5	..	⅝ — ¾	..	6 8 1	Roy. Elec. Co., Montreal, 4½ % 1st Mort Deb.	100	4½	4½	99 —101	..	4 9 4
Do. 5 % Deb.	100	5	5	91 — 93	..	5 7 6	Shawinigan Water, Capital ..	$100	5½	6†	131 —136	−2	4 8 8
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	90½ — 92½	−1	6 9 9	Do. 5 % Con. 1st Mort. Bonds	$50	5	5	105 —107	..	4 13 6
Elec. Supply Victoria, 6 % 1st Mort. Deb.	100	5	5	87½ — 90½	..	5 19 6	Do. 4½ % Per. Deb.	Stock	4½	4½	100½ —102½	..	4 7 10
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$100	5	5	93 — 95	+1	5 5 8	Toronto Power, 4½ % Deb. ..	Do.	4½	4½	97 —100	..	4 10 0
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	⅛ — ¼	..	Nil	Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	81½ — 91½	−1	5 9 3
Do. 6 % Pref.	1	6	6†	⅛ — ¼	..	11 5 8	Victoria Falls Power, Pref. ..	1	6	6	⅛ — ⅛	..	6 8 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	10 ⅞ —104½	..	4 15 8	West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	108 —105	..	5 14 8
Madras, Ord.	5	Nil	..	1¼ — 1⅜	..	..							
Melbourne, 5 % 1st Mort. Deb ..	100	5	5	103 —106	..	4 14 4							
Mexican Lt. & Power, Common	$100	4	4	45 — 50	−5	8 0 0							
Do. 7 % Cum. Pref.	$100	7	7	75 — 80	−5	8 15 0							
Do. 5 % 1st Mort. Gold Bds.		5	5	71 — 76	−1	6 11 7							
Do. 5 % 2nd Mort. Bonds ..	100	5	5	65 — 70	..	7 2 10							

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4½	..	6⅞ — 7⅛	..	6 2 0	Monte Video Telephone, Ord. ..	1	6	6	¾ — 1 xd	..	6 0 0
Do. 5 % Deb. Red.	Bonds	5	5	95 — 97	..	5 8 1	Do. 5 % Pref.	1	5	5	1⅛ — 1⅜ xd	..	6 8 1
American Telep. & Teleg., Cap.	$100	8	8	123 —125	−1	6 8 0	New York Telep., 4½% Gen. Bnds.	100	4½	4½	96½ — 97½ xd	..	4 12 1
Do. Collat. Trust	$1 00	4	4	89 — 92	−1½	4 7 0	Oriental Telep. and Elec. ..	1	10	10†	1⅞ — 2 xd	..	5 0 0
Anglo-American Telegraph ..	Stock	3	3	62 — 65	..	4 12 4	Do. 6 % Cum. Pref.	1	6	6	1⅛ — 1⅜ xd	..	5 1 1
Do. 6 % Pref.	Do.	6	6	104½—105½	..	5 13 9	Do. 4 % Red. Deb.	Stock	4	4	86 — 88	..	4 10 11
Do Def.	Do.	30/-	..	23½ — 23¾	..	6 6 4	Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	96½ — 98½	..	4 1 3
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2	Reuter's	10	10	10†	9 — 10	..	10 0 0
Chili Telephone	5	8	..	7⅞ — 7¹⅞	..	5 5 7	Submarine Cables Trust	Cert.	6	6	121 —124	..	4 16 0
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	79 — 81	..	4 18 9	Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	95 — 97	..	4 12 11
Cuba Telegraph	10	6	6†	8½ — 9½	..	6 9 9	United River Plate Telephone	5	8	6†	6½ — 6¾ xd	..	5 1 6
Do. 10 % Pref.	10	10	10	14½ — 15½	..	6 11 2	Do. 5 % Cum. Pref.	5	5	5	5 — 5⅛	..	4 11 0
Direct Spanish Telegraph, Ord.	5	4	4	8½ — 8¾	..	5 6 8	West Coast of America	2½	2½	..	1⅜ — 1⅝	..	4 8 4
Do. 10 % Cum. Pref	5	10	..	6¾ — 7⅛	..	6 12 0	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	94 — 97	..	4 2 8
Direct United States Cable ..	10	4	4†	6⅝ — 7⅛ xd	..	5 12 3	West India and Panama Teleg.	10	1½	..	2⅝ — 2⅞	− ⅛	4 17 6
Direct W. India Cable, 4½ % Red. Deb.	100	4½	4½	98 —100	..	4 10 0	Do. 6 % Cum. 1st Pref. ..	10	6	6	9½ — 10½	+ ⅛	5 17 1
Eastern Telegraph, Ord. Stock	Stock	7	7	126 —129	..	5 8 6	Do. 6 % Cum. 2nd Pref. ..	10	6	6	9½ — 9¾	..	6 3 1
Do. 3½ % Pref. Stock	Do.	3½	3½	75— 77	..	4 10 11	Do. 5 % Debs	100	5	5	98 —100	..	5 0 0
Do. 4 % Mort. Deb.	Do.	4	4	95 — 97 xd	..	4 2 6	Western Telegraph, Ltd. ..	10	7†	7	12⅝ — 13⅜	..	5 4 8
Eastern Extension	10	7	7	12½ — 13⅜	..	5 9 10	Do. 4 % Debs.	Stock	4	4	94 — 96	..	4 3 4
Do. 4 % Deb.	Stock	4	4	94 — 96	..	4 3 4	Western Union 4½ % Fdg. Bonds	$10.0	4½	4½	92 — 95	..	4 14 9
Globe Telegraph and Trust ..	10	6	6†	10⅞ — 11½	..	5 6 8							
Do. 6 % Pref.	10	6	6	11⅞ — 12⅜	..	4 17 0							
Great Northern Telegraph ..	10	20	5†	80½ — 82½	..	6 2 8							
Indo European Telegraph ..	25	13	5†	50½— 53½ xd	..	5 11 1							
Mackay Companies Common ..	$100	5	5	82 — 86	..	5 17 8							
Do. 4 % Cum. Pref.	$1 0	4	4	67 — 70	..	5 14 4							
Marconi's Wireless Telegraph ..	1	20	..	3⅝ — 3¹⅝	−⅛	6 0 9							
Do. 7 % Cum. Partic. Pref. ..	1	17	..	2⅝ — 2⅞	− ⅛	6 9 6							

* Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. 8s. in Funded Dividend Certs.

Continued on next Page.

SHARE LIST OF ELECTRICAL COMPANIES.—*(Continued.)*

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1912.	Dividends for 1913.	Closing Quotations Nov. 11th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Tramways, Pref. Ord.	1	Nil	..	3/16 — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	21/32 — 23/32	..	6 8 0
Do. 4½ % Deb.	100	4½	4½	70 — 75	..	6 0 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	11 — 13	— 3/4	..
Do. Do. Deferred	100	..	..	4 — 6	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	86 — 89	..	6 14 10
Do. 7 % Non-Cum. Pr'f.	100	3	..	48 — 51	..	5 17 8
Do. 5 % Perp. Deb.	100	5	5	89 — 92	—1	5 8 8
Do. 4½ % 2nd Deb.	100	4½	4½	75 — 78 xd	..	5 15 5
Central London Railway, Ord.	100	3	3	61 — 66	..	4 11 0
Do. Gtd. Assented	100	..	4	78 — 80	..	5 0 0
Do. Pref.	100	4	4	70 — 75	..	5 6 8
Do. Gtd. Assented	100	..	4	81 — 83	..	4 16 3
Do. Def.	100	2	..	60 — 65	..	3 1 7
Do. Gtd. Assented	100	..	4	77 — 79	..	5 1 3
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	96 — 98	—2	5 2 0
Do. Do. 1896	100	5	5	96 — 98	—2	5 2 0
Do. Do. 1901	100	5	5	95 — 97	—1	5 3 1
Do. Do. 1903	100	5	5	95 — 97	—1	5 3 1
Do. 4 % Deb.	100	4	4	90 — 93	—1	4 7 0
Hastings Trams, 6 % Pref.	1	6	6†	3/4 — 7/8	..	8 0 0
Do. 4½ % Deb.	100	4½	4½	66 — 71	..	6 6 9
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2 1/16 — 2 2/16	..	4 17 7
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	77 — 81	..	6 3 5
London and Suburban, Ord.	1	..	..	1/32 — 3/32	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	1/32 — 3/32	—1/32	..
Do. Do. 4½ % 1st Deb.	100	4½	4½	77 — 82	..	5 9 9
London Elec. Railways, 4 % Deb.	100	4	4	90 — 92	..	4 7 0
London United Trams, 4 % Deb.	100	4	4	57 — 61	—1	6 11 2
Metropolitan Railway Consol.	100	1⅝	1½†	38⅜ — 39½	— ½	4 3 10
Do. Surplus Lands	100	2⅜	2¼†	58 — 60	..	4 11 8
Do. 3½ % Deb.	100	3½	3½	83 — 85	..	4 2 4
Do. 3½ % Pref.	100	3½	3½	78 — 80	..	4 7 6
Do. 3½ % Con. Pref.	100	3½	3½	76 — 78	..	4 9 9
Metropolitan District Ord.	100	Nil	..	27⅜ — 28½	— ½	Nil
Do. 6 % Deb.	100	6	6	136 — 139	..	4 6 4
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5
Do. 4 % Prior Lien	100	4	4	93 — 95	..	4 4 3
Do. 4½ % First Pref.	100	4½	4½	81 — 83	—1	5 8 5
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	83 — 86	..	5 4 8
Do. 5 % Deb.	100	5	5	86 — 89	..	5 12 0
Potteries, Ord.	1	3½	..	1/8 — 1/4	..	..
Do. 5 % Pref.	1	5	5	1/8 — 1/4	..	7 5 6
Do. 4½ % Deb.	100	4½	4½	82 — 85	..	5 6 5
South Metro. Trams, 6 % Pref.	1	6	6†	5/8 — 3/4	..	8 0 0
Do. 4 % Deb.	100	4	4	68 — 72	..	5 11 1
Underground Elec. Railways	10	..	..	3½ — 3⅝	..	Nil
Do. "A"	1/-	..	..	1/8 — 3/16	+ 1/32	Nil
Do. 6 % First Cum. Inc. Deb.	100	6	6	110 — 113	..	5 8 1
Do. 4½ % Bonds	100	4½	4½	99 — 101	..	4 9 1
Do. 6 % Income	100	6	6	88 — 89	..	6 14 10
Yorkshire (West Riding). Ord.	5	Nil	..	1/4 — 1/2	..	Nil
Do. 6 % Pref.	5	3	1½†	3⅜ — 4	..	..
Do. 4½ % Deb.	100	4½	4½	81 — 86	+1	5 4 8

ELECTRIC RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo Arg. Trams, 1st Pref.	5	5½	5½	4⅝ — 4⅞	..	5 12 10
Do. 2nd Pref.	5	5⅛	5⅛	4 7/16 — 4 9/16	..	6 3 11
Do. 4 % Deb.	100	4	4	89½ — 91½	—1½	4 7 5
Do. 4½ % Deb.	100	4½	4½	97½ — 99½	+ ½	4 10 6
Do 5 % Deb.	100	5	5	98½ — 100½	..	4 19 6
Auckland Trams, 5 % Deb.	100	5	5	100 — 102	..	4 18 0
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11½	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	94 — 96	..	4 13 9
Do. 5 % 2nd Deb.	100	5	5	96 — 99	..	5 1 0
Brazilian Traction, Light and Power	$100	6	6†	84 — 86	+ ½	6 19 6
Brisbane Trams Invt., Ord.	5	8	8	7½ — 7⅝ xd	..	5 3 3
Do. 5 % Pref.	5	5	5	4 7/8 — 5 xd	..	4 13 0
Do. 4½ % Deb.	100	4½	4½	98 — 101	—1	4 9 1
B. Columbia Elec. Rly., Def.	100	8	8†	115 — 120	— 3½	6 13 4
Do. Pref. Ord.	100	6	6	102 — 107	—3½	5 12 2
Do. 5 % Pref.	100	5	5	99 — 102	..	4 18 0
Do. 4½ % 1st Mort. Deb.	40	4½	4½	97 — 100	..	4 10 0
Do. 4½ % Vancouver Deb.	100	4½	4½	100 — 104	..	4 6 7
Do. 4½ % Con. Deb.	100	4½	4½	90 — 93	..	4 11 5
Calcutta Trams, Ord.	5	7⅛	5†	6 — 6½	..	5 15 5
Do. 5 % Pref.	5	5	5	5 — 5¼	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	96 — 99	..	4 11 0
Cape Electric Trams	1	5/-	..	23/32 — 25/32	..	6 8 0
City Buenos Aires Trams (1904)	5	5†	5	5/8 — 11/16	..	4 13 0
Do. 4 % Deb.	100	4	4	92 — 97	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	88 — 92 xd	..	5 8 8
Havana Elec. Rly., 5 % Bonds	$1000	5	5	94½ — 98½	..	5 1 6
Kalgoorlie Elec. Trams	1	Nil	..	0 — 1/16	..	Nil
Do. 5% A Deb.	100	5	5	85 — 90	..	5 11 1
Do. 6 % B Deb.	100	3	..	10 — 20	..	..
La Plata Elec. Trams, Ord.	1	..	..	3/8 — 1/2	..	..
Do. Pref.	1	4⅜d.	6	1/4 — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	6	6†	1 — 1½	..	4 16 1
Do. 6 % Pref.	1	6	6	1 1/16 — 1 1/8	..	5 1 0
Do. 5 % Deb.	100	5	5	91 — 96	..	5 4 2
Madras Elec. Tr., 6% Cum. Pref.	5	6	6	4½ — 5½	..	5 17 1
,, Elec. Tr. (1904), Deb.	100	5	5	101 — 103	..	4 17 1
Manaos Trams & Lt., 1st Deb.	100	5	5	87 — 89	..	5 12 4
Manila Elec. R. and Ltg., Bonds	$1000	5	5	96½ — 98½	..	5 1 6
Mexico Trams Com	$100	7	7	74 — 78	+1	8 19 6
Do. Gen. Con. 5 % Bonds	..	5	5	70 — 78	+1	6 8 2
Do. 6 % Bonds	100	6	6	78 — 82	..	7 6 4
Para Elec. Rlys. & Lt., Ord.	5	10	10†	5⅜ — 5⅝	+ 1/8	8 10 2
Do. 6 % Pref.	5	6	6	4¾ — 5⅛	..	5 17 1
Do. 5 % 1st Deb.	100	5	5	97 — 99	..	5 1 0
Perth (W.A.) Elec. Tr., Ord.,	1	5½	..	1⅛ — 1⅜	..	4 0 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅛ — 5⅜	+ 1/8	5 6 8
Do. 4½ % 1st Deb.	100	4½	4½	97 — 99	+3	4 10 11
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	98 — 100	— ½	5 0 0
Do. 5 % Mort. Bonds	100	5	5	88 — 90	— ½	5 11 1
Sao Paulo Tram., Lt. and P. 5 % 1st Deb.	$500	5	5	98 — 101	..	4 19 0
Singapore Trams, 5 % Deb.	100	5	5	86 — 90	..	5 11 1
Southern El. Tr. B.A., 5 % Deb.	100	5	5	93 — 95	..	5 5 3
Un. Elec. Trams Monte Video	5	7	7	4⅞ — 5⅛	..	6 13 4
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	93½ — 96½ xd	..	5 3 8
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	98½ — 100½	..	4 9 7

MANUFACTURING COMPANIES.

Aron, Ord.	1	7	..	9/16 — 13/16	..	8 12 4
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	7 18 4
Babcock & Wilcox	1	16	..	2¾ — 3	..	5 6 8
Do. Pref.	1	6	6	1 5/8 — 1 7/8	..	4 3 6
British Aluminium, Ord.	1	..	..	1⅛ — 1¼	— 1/32	..
Do. 6 % Cum. Pref.	1	6	6	1⅛ — 1⅜	..	6 8 0
Do. 5 % Prior Liens Debs.	100	5	5	93 — 96	..	5 4 2
Do. Deb. Stk.	100	5	5	85½ — 87½	..	5 14 3
B.I. & Helsby Cables	5	10	..	8 — 8½	..	5 17 8
Do. Pref.	5	6	6	6 — 6½	..	4 12 4
Do. Deb.	100	4½	4½	100 — 103	..	4 7 5
British Thomson-Houston, Deb.	100	4½	4½	92 — 95	..	4 14 9
British Westinghouse, Pref.	3	Nil	..	1/8 — 1/4	..	Nil
Do. Deb.	100	4	4	66 — 69	..	5 15 11
Do. 6 % Prior Lien	100	6	6	100 — 103	..	5 16 6
Browett, Lindley, Ord.	1	..	..	2/- — 3/-	..	Nil
Do. Pref.	1	..	..	8/- — 8/6	..	Nil
Brush, 7 % Pref.	2	Nil	..	0 — 1/2	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	70½ — 75½	..	6 12 5
Do. 4½ % Deb.	100	4½	4½	35½ — 40½	..	11 2 2
Do. 4½ % Second Deb.	100	4½	4½	23 — 27	..	16 13 4
Callender's Cable	5	15	5†	10½ — 11½ xd	..	6 10 5
Do. Pref.	5	5	5	5 — 5½	..	4 15 3
Do. Deb.	100	4½	4½	96 — 99	..	4 10 6
Castner-Kellner	1	20	..	3 1/8 — 3 1/16	..	5 1 7
Do. Deb.	100	4½	4½	103 — 105	..	4 5 9
Crompton & Co., Deb.	100	5	5	62 — 67	+1	7 9 3
Dick, Kerr	1	Nil	..	1/16 — 3/16	..	..
Do. Pref.	1	6	6	3 1/16 — 3 3/16 xd	..	7 2 2
Edison & Swan, A, £2 paid	5	Nil	..	0 — 1/8	..	Nil
Do. fully paid	5	Nil	..	1/2 — 1½	— ½	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	63 — 68	..	7 7 1
Electric Construction	1	5	..	1/16 — 1 1/16	..	7 5 6
Do. Pref.	1	7	7	1 1/16 — 1 1/8	..	6 11 9
Greenwood & Batley, Pref.	10	7	7	6⅞ — 7½	..	9 13 2
Do. Deb.	100	5	..	92 — 94	..	5 4 2
General Electric, 6 % Pref.	10	6	6	9½ — 10⅜	+ ⅛	5 15 8
Do. Deb.	100	4	4	88 — 93	..	4 6 0
Henley's, Ord.	5	15	10†	12½ — 13	..	5 15 5
Do. Pref.	5	4½	4½	4 13/16 — 5 1/16	..	4 8 11
Do. Deb.	100	4½	4½	101 — 103	..	4 7 5
India-Rubber, G. & T.	10	7½	5	13 — 14	..	5 7 2
Do. Pref.	10	5	5	9½ — 10	..	5 0 0
Telegraph Construction	12	20	5†	37 — 39	..	6 3 1
Do. Deb.	100	4	4	96 — 98	..	4 1 8
Willans & Robinson, 4 % 1st Mort. Deb.	100	4	4	55 — 60	..	6 13 4
Do. B 4 % Cum. Pref.	100	..	..	8 — 13	+4	..

* Unless otherwise stated all shares are fully paid. † Interim dividend.

Bank rate of Discount 5 per cent., October 2nd, 1913.

ELECTRICAL ACCIDENTS IN MINES.

(*Continued from page* 733.)

In addition to the foregoing, an engineman on the surface had his arm burned through a short-circuit from an ammeter in the engine room, and two persons were prosecuted by the owners and fined £1 each for attempting to relight a safety lamp with the electrical relighting apparatus when not authorised to do so.

In the Newcastle district there were two fatal accidents underground and one on the surface, while three persons were injured.

One of the fatal accidents occurred at Hartford Colliery, where some alterations were being made by the British Westinghouse Co. to the main switch handles at the pit bottom. It was a Saturday afternoon; one of the Westinghouse Co.'s fitters was at work on the job along with the colliery electrician. The current was three-phase (2,750 volts), and was not cut off at the time at bank; the electrician had, however, attempted to get communication by telephone to bank to get the current cut off, but without success; they could not get the cage at the time, so they decided to proceed. The deceased, who was a skilled electrician, went down the pit later in the afternoon to examine the alterations made; there were no lights; no one appears to have told him that the current was on, and in all probability he assumed that the current was off and the apparatus dead. This was a reasonable assumption for him to make.

He received a shock whilst trying the working of the switch, and died without recovering consciousness, although he was pulled off at once and artificial respiration was resorted to. It was most regrettable that the deceased was not warned that the switch was "live."

The report is very incomplete, and the strange thing about it is, how did the other two men who had been working at the switches avoid receiving an electric shock?

The other accident occurred at Chopwell Colliery, and involved the death of a coal hewer. "A motor-driven coal face conveyor was at work in what is known as 8th West Mothergate district of the New Stone Coal Seam. A defect had arisen in the switch controlling the motor, which switch was fastened, like the motor, to the framework of the conveyor. Hudson went to the switch when he heard of the defect, saying 'I think I can put that right.' He lifted the cover from the switch, and then called for the current to be switched on by means of a neighbouring switch a few yards out-bye of the defective switch. When the current was switched on, it was seen that Hudson was suffering from shock from the defective switch he was handling. Current was quickly switched off, but the shock proved to be fatal. The switch from which the fatal shock was received was not earthed, though the pressure was 600 volts alternating current."

Under instructions from the Home Office, legal proceedings were taken against the manager for an infringement of Rule 8 (*a*) of the recently established electricity rules, which requires that "All metallic sheaths, switch and fuse covers, &c., shall be earthed by connection to an earthing system at the surface of the mine."

The case was heard before the Gateshead magistrates. The facts were admitted by the defence; they, however, claimed that as the coal conveyor was in use before June 1st, 1911, the exemption Rule 20 (*b*) applied, and that that exemption during its continuance held free from the necessity of any earth connection all apparatus which was not required to be earthed by the (recently superseded) 1905 code of rules, that is to say, all portable apparatus. The magistrates accepted this view and dismissed the case. They were asked to state a case, and on appeal it was again dismissed, and the magistrates' decision upheld. The conveyor switch has, however, since been connected to earth.

The fatal accident on the surface occurred at Mickley Colliery to a young man, 20 years of age, in charge of an electric haulage engine. The motor was 10 H.P., D.C., 450 volts. There was an open-type metallic starter, with no-volt release, mounted on a pillar about 3 ft. behind the motor, and an enclosed double-pole switch with fuses. He was putting the clutch into gear ready for starting the full set. He was seen with his left hand on the clutch lever and his right extended towards the starter, which was behind him, and was looking out of the window of the engine room, when he fell backwards. His right hand probably came in contact with a live part of the starter.

This is clearly an accident which would have been avoided had the starter been enclosed. No particulars are given of the non-fatal accidents.

In No. 3 district (Durham) there was one fatal accident underground and one on the surface. The latter was of a very simple character, and would not have happened if ordinary precautions had been observed by the deceased. It occurred at Bowden Close Colliery, belonging to Messrs. Pease & Partners, Ltd. An electrician was sent to fit an adapter and portable lamp to a lampholder. He knew the current was on, and he had frequently done similar work. After attaching a length of flexible cable to an adapter, he placed the latter in the lampholder, and was afterwards found with the bared end of the flexible cable in his hand. All efforts to restore him were unsuccessful. The pressure was 250 volts alternating between one phase and neutral.

It is admittedly difficult to prevent accidents such as this, and it only shows how very important it is that the circuit should be broken before the very simplest operation is done. Evidently the man quite unconsciously held the other end of the bared cable in his hand while in the act of fitting the adapter, and had he only taken the precaution of cutting off the current, his life would have been saved.

The underground accident caused the death of a "siding" attendant. The deceased was on his way in-bye when he stopped to speak to another "siding" attendant, and as the electric lights at once went out, the latter thought the deceased had switched them off in fun, as had previously happened. The deceased was shortly afterwards found lying insensible on his back with one of the lighting cables broken in his hand. His oil lamp was standing burning close at hand. It is not known what the deceased was doing, as the lighting wires were over 6 ft. from the floor. The pressure was 250 volts alternating. One wire was broken, and on the other there was no insulation for a length of 1½ in. The deceased was got clear and efficient artificial respiration resorted to, but without success, in spite of continuous efforts for two hours.

It would appear that the deceased had been in some way interfering with the wires, probably with the object of finding out what was wrong, and paid with his life for his curiosity. Practical joking, such as switching off lights in fun, cannot be too strongly discountenanced by the management.

In No. 4 district (Yorkshire) there were two fatal accidents, one on the surface and one underground, and 10 non-fatal accidents causing injury to 11 persons.

The surface fatal accident occurred in the coke-oven stamper house connected with a battery of Simon Carve by-product ovens; the deceased's occupation was that of coke-oven labourer, and, amongst other duties, he had to "set the ram" right for entering the coking chamber. He had nothing to do with the mechanical parts, which were manipulated by an attendant named McLean, who had control of two electric motors, one working the stamper, the other working the ram. The stamper, worked by a 7½-H.P. motor, taking 550 volts alternating current, travelled 30 ft. backwards and forwards, and took its power from three bare wires. When the traverser and coal box were in one position there was 3 ft. 6 in. gap between the movable building and the coke-oven wall, and on the top of the coke ovens there was a substantial two-railed iron fence. It seems that after asking an attendant if the coke was nearly ready, a fact which he could have seen for himself, the deceased, in order to get from the top of the coke ovens into the stamping house, climbed over the iron fence referred to, stepped over the 3 ft. 6 in. gap, and while getting on to the floor of the stamping house came in contact with two live wires and was killed. Deceased seems to have been making a "short cut" by a forbidden path from one point to another, which short cut took him close to some wires which he must have known were live, and which were necessarily, for the working of the machinery, bare; he failed to appreciate the true meaning of the fence which

had been placed there to protect the wires and avoid danger to the persons employed.

At the inquest the verdict of the jury was that the man "died from electric shock which was accidentally sustained," but this is clearly a case where the man himself was to blame.

The underground fatality occurred to a youth named Henry Gillies on June 20th, near an electrically-driven coal-cutter in a machine face in the Lidgett seam of coal.

The system of supply was 500 to 550 volts D.C. The current for this machine was taken from a distribution board underground, a voltmeter on which registered only 400 volts, due probably to the running of a haulage motor on the same circuit. The gate-end switch was enclosed, and beyond was a metal box having a movable cover, containing two open switches, one on each pole. From there the conductors entered a plug connector to receive one end of the trailing cable, which was a two-core, leather covered cable 80 yd. in length. The attachment to the coal-cutter was by means of a plug connector similar in design to the one at the other end of the trailing cable.

The coal-cutter, the frame of which was not earthed, was of the bar type, driven by a 25-H.P. D.C. compound wound motor, taking about 48 amperes at 400 volts.

It seemed that the deceased's duty was to clean out the "holings" behind the machine. When kneeling on the damp floor he made contact with the machine haulage rope, which proved to be "live," and was killed. Artificial respiration was tried without avail.

Mr. Robert Nelson, H.M. Electrical Inspector of Mines, attended the inquest, and expressed the opinion that the accident was primarily caused by bad contact between the live parts of the connector and the contacts for the latter at the coal-cutter. In cases of bad contact an electric arc is formed, and Mr. Nelson thought that such an arc, spreading to the side of the machine, had made the whole machine frame "live," and that the youth Gillies received the fatal shock from the haulage rope, which was, of course, in electrical contact with the machine. The question arose as to why the coal-cutter machine was not earthed properly. Early in March, fully three months before the accident, a new code of electricity rules was established for coal mines. One of these rules, 8 (*a*), requires the coal-cutter frames to be earthed for the safety of persons operating them. Such an earth connection was not, prior to the above date, compulsory; there appears to have been ample time to allow of the new regulation being complied with, for there was already an earth-wire laid at the gate-end, and this could easily have been extended to the machine frame. Had the matter promptly received the attention of the management, and had the safeguard of an earth connection been provided, the accident would, no doubt, have been avoided. The verdict was "Accidental death," but the jury added that it would have been better had the earthing been carried out more expeditiously.

Of the non-fatal accidents by electricity, five occasioning injury to six persons occurred on the surface, and five causing injury to five persons, underground. Of the five surface accidents, four happened to electricians or persons in charge of apparatus. Two of the underground ones were caused by persons making contact with defective cables, another being due to a worker accidentally falling with his hand on terminals while a controller case was open for the purpose of examination.

In addition to these, "electricity" was said to be the cause of an underground fire, but this *was rather due to the presence of inflammable material in a motor house than to the actual use of electricity.* A breakdown had occurred at the commutator of the motor, and if there had been no inflammable material in the neighbourhood of the motor, or if the live parts of the latter *had been completely enclosed*, in all probability there would have been no dangerous occurrence to report.

(*To be continued.*)

The Electric Treatment of Bauxite.—Of the products of the treatment of the mineral bauxite by means of the electric furnace, apart from aluminium, corundum ranks as the most important. It is used for polishing purposes under a variety of names and in various forms—emery wheels, polishing stones, &c. The industry was started in Bohemia, but is now chiefly prosecuted in France, where the La Bathie works have a capacity of 3,000 H.P., and in the United States, where a factory of a capacity of 3,600 H.P., derived from the Niagara Falls, turns out 16,000 tons a year. In the electric furnace bauxite undergoes many transformations. By fusion, together with purification by reduction more or less complete, the whole series of aluminous abrading materials are obtained; the last stage is pure alumina, used for the manufacture of aluminium. The reducing treatment may even result in yielding complex alloys, and, lastly, aluminium and carbide of aluminium. This carbide, which is found in many combinations, is essentially harmful to all these products, in which it leads to a rapid disintegration on contact with damp air. The reduction, made in an atmosphere of nitrogen by means of long rotary furnaces, furnishes nitride of aluminium, a very interesting new industrial product; treated with an alkaline solution it is decomposed into salts of ammonia and pure alumina. The profit obtained from the salts of ammonia lessens proportionately the cost of the production of the alumina, and consequently allows of the production of aluminium at a much lower price.—*Bulletin de la Société Internationale des Electriciens.*

TABLE SHOWING AGGREGATE ELECTRICAL HORSE-POWER IN MINES IN THE UNITED KINGDOM.

	No. of mines.	Surface.						Underground.				
		Winding.	Ventilation.	Haulage.	Coal washing or screening.	Miscellaneous.	Total.	Haulage.	Pumping.	Portable machinery.	Miscellaneous.	Total.
No. 1 District: Scotland ...	290	1,666	2,363½	2,527	5,513	6,944½	19,014	22,813½	36,143¾	17,367	3,018¾	79,343
No. 2 District: Newcastle-on-Tyne	111	3,159	4,402½	2,333	3,318	5,511	18,723½	11,361½	13,128½	1,627½	2,309½	28,427
No. 3 District: Durham ...	145	2,149	6,224	3,748	6,080	9,409	27,610	15,918	17,988	1,550	700	36,156
No. 4 District: Yorkshire and North Midland	317	657	3,947½	2,088	16,836	18,729	42,257½	24,132	11,880	7,250	2,353	45,615
No. 5 District: Manchester and Ireland ...	73	110	830	246	1,167	2,052¼	4,405¼	2,666	3,097¾	234	437	6,434¾
No. 6 District: Liverpool and North Wales ...	82	25	1,111½	255	1,304	1,309	4,004½	5,686	4,132½	409	820½	11,048
No. 7 District: South Wales ...	286	16,129½	11,299½	11,696	7,075½	24,711¼	70,911¾	32,733½	43,638½	926	1,183¼	78,481½
No. 8 District: Midland and Southern Counties	121	—	715	861½	2,276	3,309½	7,162	14,714½	14,309½	1,674	461½	31,162½
Total ...	1,425	23,895½	30,893½	23,754½	43,569½	71,975½	194,088½	130,025	144,318½	31,037½	11,286½	316,667½

THE ART OF TRAVELLING.

By S. WALLACE WILKINS.

Recent correspondence in the Electrical Review has suggested that the functions of that much-abused man, the commercial traveller, are misunderstood, both by employers and buyers. The scope of travellers varies remarkably in different trades. The methods adopted by a man selling drapers' goods would be useless if employed in selling agricultural machinery. The difference between trades lies in the number of articles sold. Where the quantity is great, the goods are kept in stock; the trade is wholesale, and the traveller deals in bulk with a recognised *clientèle*. Where the quantity is small, the goods go direct from manufacturer to user through an intermediary, who does not handle them.

In selling bulk goods to stock-holders, business capacity and personality are the qualities most valuable in a traveller. The capacity for making friends and pleasing them is foremost. He need know little of his goods, they need be little more than paper expressions to him.

In selling specialised articles technical knowledge is before all things necessary.

The electrical trade generally covers many trades with totally different characteristics. Electric lamps and wiring sundries have been sold very successfully, in the writer's experience, by drapers' travellers. They come under the head of bulk supplies, and although working knowledge of their manufacture is distinctly an advantage, it can be dispensed with.

However, the sale of these articles is confined to a few firms. The traveller with whom we are most concerned is the seller of specialised articles. It is in this department that talent is called for, and, unfortunately, is not forthcoming.

The theory of buying and selling entertained by most people not in business is that the buyer becomes acquainted with goods by perusing advertisements, then obtaining competitive prices through the post, and placing his order with the lowest tenderer. The traveller, in this scheme of things, is a nuisance; he is an importunate interloper, endeavouring to upset the even tenor of business competition by his persuasive arts.

Practice, on the contrary, makes the traveller, if he be worthy of the name, the most important agent in the transaction. He is invaluable to the buyer for the information he is able to give, and as the responsible party to see the contract carried out to the customer's liking. He is invaluable to his principals for information of another character which he brings both before and after the business.

Let us define "traveller." The man who pays a call—if indeed an interview be granted—to keep the name of his firm before the possible purchaser is not a traveller; he is a waster. Abolish him, by all means; a page in the Electrical Review costs less and does more. A traveller that is worthy of the name does not call for orders. He is a diplomatist. He is out for information, to find where business is going, the special wants of the purchaser requiring attention, and what steps have to be taken to get his firm favourable consideration. He introduces the personal touches with negotiations that just remove the transaction out of the groove of relentless bargaining. He arranges the call of his managing director on the right person at the right time. He sees that the way of the purchaser is made smooth. Sometimes he finds out what the other fellow's price is—but tells this not in Gath. When it comes to placing the actual order he is not wanted any more, he is above such clerical details—his work is done—and he is nursing his next job.

Such men are ambassadors of commerce. They act as their firm's antennæ, to keep the works up-to-date and the latest requirements of the market before the managers, and to ascertain where their firm's goods fall short of new standards. Such men get valuable information out of a casual conversation with a station engineer without the latter being aware that he has said anything. He will get equally valuable information sometimes out of the office boy. If he can clinch a transaction, and come away with the order, so much the better, but if he regards that as his primary duty, he is not a first-class representative, and he is likely to waste a great deal of valuable time. If he is judged by the business he brings in his pocket, he will then concentrate on his certainties, and neglect his uncertainties.

This class of man must know his subject, and he must be a man of education. He is best supplied from the class of premium apprentices, after a few years' mature experience, but men with a personality must be selected. It is a great mistake to send men round who are of a lower social grade than those on whom they call. A man can easily stoop, but he cannot increase his stature.

It must not be forgotten that the principal aim of the representative, from the manufacturer's point of view, is to lift each transaction as far as possible out of the "lowest tender" stage. Roughly speaking, business that goes to the lowest price out of a dozen is no good to anyone. It is like throwing a bone to the dogs. All the dogs get mauled, and the one that gets the bone has a sorry meal. The purchaser is usually also to be pitied. Instead of a conscientious job, he gets as little as his suppliers can give him to keep out of the law courts.

There are always points in which each customer's requirements call for something special. It is the traveller's duty to cater for these minor embellishments, which may decide a contract. There are always points in which the traveller's make of goods is superior to others for the particular job in hand. It is the traveller's duty to emphasise these points.

The traveller's calling in the electrical engineering and allied trades is an exacting one, in which a gentleman, with more than average brains, is required. To the detriment of the trade as a whole, too few of such are employed.

In a number of firms the job of traveller is a sort of "Chiltern Hundreds" for anyone who has turned out a failure in another capacity. An unsuccessful manager, a discontented clerk, a redundant showroom hand, the managing director's importunate wife's cousin—all are dumped down to try their hand at travelling. This is the type of man who "leaves his card," and helps to swell the transit companies' dividends.

The firms who regard travelling as a most serious and trustworthy job, who map out their business campaign under a responsible director with a qualified staff, and who consider the travelling staff as forming the necessary link between the publicity campaign and the shops, will economise on their selling expenses, and secure greater efficiency. The publicity manager has now come—the director of travellers and outside organiser is in most cases yet to be created.

AMERICAN METHODS ARE NOT SUITABLE FOR BRITISH CONDITIONS.

By A. HUGH SEABROOK.

This has been a generally accepted statement made on the authority of those who have never tried such methods, and has been almost universally blessed by the technical electrical Press.

As sound advice, I have never agreed with it, but finding myself in a minority of about one it seemed futile to labour in opposition to general opinion.

Now, I wonder how many electrical men have carefully and thoroughly read the accounts of the proceedings and conferences of the recent annual meeting and Exhibition of the British Commercial Gas Association.

I have read practically every word, I have visited the Exhibition several times and have had discussions with the organisers, and what do I find? This: that I cannot detect any difference between the principles, practices, arguments and advice of those gas men and those of the foremost American commercial electrical development men with whom I have also had discussions, and the proceedings of whose conferences I have read.

Principles which are scouted in the British electrical industry are being taken hold of with both hands by the British gas industry.

One hears and reads of the most eminent gas men of to-day telling their audiences that gas supply is a matter of salesmanship, and salesmanship *alone*.

They urge the discarding of the "canvasser" and advocate the employment of highly paid, well educated and intelligent gas salesmen.

They urge that the man who can sell is worth more than the man who merely makes: that the salesman should be paid at as high and higher rates than the engineer; that every gas undertaking should run a gas sales department, and that the satisfaction and convenience of the consumer are of all importance. Every speech (and these were made by gas engineers, managers, chairmen and directors, as well as those representing the purely selling staff) was on sales departments, publicity development, education of the public and demonstrations of gas appliances.

The note of keen enthusiasm was strikingly significant, such enthusiasm as we in the British electrical industry know nothing of, and pour contempt upon.

From the point of enthusiasm I could hardly believe I was not at a convention of the National Electric Light Association of America.

Now, the electrical man who believes the statement forming the subject of this article will say: "Oh yes, of course they know it (gas) is a dying industry, and only by such artificial boosting can they keep it alive." Well, then, I will ask him why does the American electric supply industry adopt precisely the same methods in a new country where there are many towns where gas does not exist at all, and where it has not nearly the hold on the public that it has here?

There (U.S.) it is most certainly not a case of boosting up a dying industry suffering from the competition of a superior agency. No, it is because the so-called American methods mean increased prosperity owing to the rapidly increased business they result in.

To run a "Sales Department" in the British electrical supply business is even to-day *infra dig.*; it indicates that the management responsible for inaugurating it is displaying an indecent enthusiasm which should never be allowed to be noticeable. Even the big electric supply companies only inaugurate sales departments furtively, and jump if anyone suggests that they are really trying to increase sales in their areas.

Don't let electrical men in this county adopt the ostrich-like method of depreciating this increasing enthusiasm in the gas industry! Don't think that these gas men do not actually believe that they have a commodity to sell that is better in every way than any competitor!

They do believe in it, and therein lies the seriousness of their competition. One cannot talk to any prominent gas man for five minutes and not realise this. The trouble is that we do not believe in electricity as our American electrical cousins do, and as our competitors believe in gas.

Look at our Association and Institution discussions for examples of this blatant and unashamed scepticism in regard to electricity and its possibilities. Do you ever read anything like it in the gas journals at home, or the electrical journals abroad? Those industries would not tolerate it for a moment. With all the multitudinous weaknesess in the armour of our gas competitors, they take very good care not to expose them; how it is done is remarkable.

We have the purest, therefore the best and most hygienic agency, and we seem to endeavour to hide its advantages from the public and spend our spare time in publicly discussing imaginary defects which do not exist.

There is another parallel between the American electrical and British gas industries. It is in a direction unstudied, misunderstood and sneered at when mentioned in electrical circles here. I refer to the close attention given to the human element in the *personnel* of the employés.

Both industries pay an increasing regard to welfare work, contentment of, and improved conditions for, workpeople, their proper feeding, housing, and so on. A great deal of time is given up to the consideration of these subjects, and they are well worth it. They result in the best work being obtained from employés.

An increase in the efficiency of staff and workpeople has an enormous beneficial effect upon an industry.

Do you ever hear the subject mentioned in electrical circles here? The only efficiency talk we hear of is a fraction of 1 per cent. improvement in the steam consumption of a turbine at an altogether disproportionate risk and expenditure of money.

I wonder when we shall realise that such things are as nought compared to the effect of a bigger business, and a very slight increase (obtainable at almost negligible cost) in the personal efficiency of staff and workpeople.

It is fairly well known that British gas companies lead the world in the successful application of co-partnership principles, and American electric supply men are following closely upon their heels.

It may surprise electrical men here to know that these industries have standing committees who deal solely with these questions.

I have kept silent for some years on the question of American methods in regard to electricity supply, because I was always met with the scornful objection that such may be all very well there, but would never go down with the British public.

I have found that they "went down" very well with the diverse specimens of British public with whom I have had to deal, and now that I see another great industry applying them with unqualified success, I think it time to suggest that it may be worth the while of our very superior industry to look into them.

I was delighted to read Mr. Vernier's spirited address to the Newcastle Section of the I.E.E. I believe we require a few such thorough-going pessimists (pessimists, not in regard to the possibilities and prospects of the industry, but men wholly discontented with present progress) to scourge, irritate and abuse all (and there appear to be many) who are disposed to be satisfied with the present state of things.

The following hinges on an interesting portion of Mr. Vernier's address. The enlightened and successful business methods in vogue in the American electrical and British gas industries invite still further thought, and one then realises that in America municipal electrical undertakings are hardly known, and of the British gas authorities, by far the largest (they are actually the largest in the world) are the London gas companies.

In both countries there are a few men at the head of each industry personally controlling millions of capital, unfettered by either State or municipal red tape and restrictions, free to spend money in development, able to engage the best brains the countries can produce, and "big" enough to dictate to their respective industries what is best for them to do.

By force of example and financial weight, and not by any means omitting high personal ability, what men like Insull and Gilchrist say to the American electrical industry that industry does, and does to its continual advantage.

Similarly, that which Sir Corbet Woodall tells the British gas industry to do, it likewise does, also immensely to its advantage.

Take the case of the inability of municipal trading undertakings to subscribe to a co-operative publicity campaign; municipal electrical men have grumbled and complained, for more years than one cares to remember, that they are unable to form a central publicity organisation to educate the public to the advantages of the uses of electricity.

Now, what happens when the gas industry gets up against the same problem?

Mr. Goodenough (you can see the shadow of Sir Corbet Woodall behind him) immediately goes straight to the President of the Local Government Board and gets an arrangement made whereby municipal gas undertakings can subscribe in effect to the British Commercial Gas Association funds.

Why have municipal electrical undertakings been unable to get the same privilege? Simply because we *are* nearly all municipal, which is the same thing as saying that we are each self-contained, limited by parochial boundaries, and parochial ideas, and have no sense of combination, consequently we have no "big" man, and finally, and most important, the municipalities who do possess electrical supply undertakings are not sufficiently enamoured of them to wish to further increase their spheres of influence.

Do you suppose that if this were not so, the Association of Municipal Corporations could not get any such powers at any moment?

The attitude of this Association is, to all intents and purposes, not only apathetic, but even opposed to any further facilities being granted to municipal electrical undertakings to increase their business.

We have no such men here as Insull and Woodall, because we are municipalised ; the convener of the Electricity Committee of such an important city as Glasgow has not as much power as a chairman of a small electric supply company. He has actually no power at all as regards the industry

He cannot talk with the power of millions sterling to back up what he says. He can only try and persuade. Only money talks. Goodness knows what can be done except persistent agitation, but there is one feeble stray ray of hope.

It is within the bounds of possibility that the London County Council may be induced to bring about a consolidation of London electric supplies in the near future, and may further be induced, while retaining a certain amount of control, to arrange with a powerful commercial organisation to operate the immense undertaking—not only the generation of electricity, which is of comparatively small importance, but the distribution and selling of electricity as well.

In view of the present foolhardy craze for nationalisation and municipalisation, it is, as I have said, only a faint hope. But it is the sole hope in this country of raising an electrical equivalent of Insull or Woodall, who can talk with the necessary financial weight behind him and lead the whole British electrical supply industry.

He need not be a technical man any more than are the two men I have mentioned, in fact, a non-technical man might be a distinct advantage. One can see a few men —and only a very few—leading other great industries to success whom one would like to see leading the British electrical supply industry.

If, however, the more than probable happens, and we get a London County Council management, it seems to me that the last ray of hope will be gone of ever building up a great supply industry in this country. Such a management could never negotiate railway supplies, for instance, because such negotiations are generally arranged financially in such a way that no municipal management could conduct them ; apart from that, railway companies are not likely to go to a municipal electrical supply for their power, knowing as they do that such a management has to respond to political changes and influences.

Without railway supplies, Consolidated London electrical supply cannot obtain the diversity of load required to attain the lowest general prices of energy. As it is, many of the railway supplies are already lost to the general London business for 50 years, because so many of the companies have installed, and are installing, their own power plants. This is unfortunate for two reasons, one being that these plants will perpetuate for many years the destruction of the by-products of coal by burning it on boiler grates, whereas it is of vital importance to the country that these by-products should be preserved, and only gas-fired boilers or gas-driven turbines (which will assuredly be developed in the near future) used for the generation of electricity.

The second reason is that such power plants will also perpetuate for many years the generation of electricity in London, whereas that operation should in the future be carried out only in the coalfields of Warwickshire and Kent by the above-mentioned means and energy transmitted to London by high-pressure overhead transmission lines, fenced in like railway tracks and skirting the intermediate towns.

The cost of freight is continually increasing, due to increased wages and so on, whereas the art of constructing and maintaining very high-pressure aerial lines is so much better understood, resulting in decreased cost per 1,000 KW. per mile, that I am not certain that even at the present moment the balance may not be in favour of electrical transmission as against coal carriage.

How could the London County Council take upon itself a task of such magnitude and responsibility, necessitating the purchase and operation of several coal mines and many auxiliary operations, each in itself a large technical business ?

If the County Council retains the business, we shall not get our " big " electrical supply man, so badly needed to lead the industry, and we shall potter along with the old ideas which go no further than a generating station at Barking for bulk supplies, leaving the present muddle and mixture of distribution to go on indefinitely.

I am afraid at first sight it may appear that I have wandered far from the subject of my article, but yet I do not think I have in reality, because I think that American electrical men, if unhampered by State or municipality, would tackle the London problem much on the lines I have indicated.

AN ELECTROSTATIC OSCILLOGRAPH.

At a meeting of the Physical Society of London, on October 24th, a paper on "An Electrostatic Oscillograph," by Messrs. H. Ho and S. Koto, was read by the latter.

The paper describes an electrostatic oscillograph suitable for recording very high voltages. Two vertical bronze strips pass symmetrically between two parallel metallic plates called "field plates." They are connected at their lower ends by a silk fibre, which passes under an ivory pulley. An extremely small mirror is fixed to the strips. This arrangement constitutes the vibrator, which, mounted on an ebonite frame, is immersed in an oil bath. To the upper extremities of the strips are connected the terminals of a direct-current voltage of about 300. The alternating voltage to be recorded is connected to the "field plates," in parallel with which there are two oil condensers in series. The electrical mid-point of the direct-current battery is connected to a point between the condensers.

The turning moment on the strips is proportional to the product of the momentary values of the alternating-current voltage and the direct-current voltage, so that if the latter is constant the deflection of the mirror accurately follows the variation of the former.

Oil plays an important part, not only acting as a damping agent and insulator, but increasing the sensitiveness on account of its high dielectric constant.

In cases where the voltage is low, but the source of energy is so limited that a sufficient current cannot be taken to actuate the ordinary oscillograph, the electrostatic vibrator may be used by applying the voltage in question to the strips, while the terminals of a high-tension battery, or influence machine, are connected to the "field plates." The instrument may also be used for recording very small currents by replacing the oil condensers by two exactly equal resistances, which are traversed by the current.

In the discussion, Mr. A. Campbell said it was a considerable advantage to be able to do without high resistances, and Mr. R. S. Whipple emphasised the commercial advantage of the instrument, as high resistances were very expensive.

Mr. J. T. Irwin said the principal difficulty with an electrostatic oscillograph was that a very high polarising voltage was required if the zero was to be stable. The authors had reversed the process—using a small polarising voltage compared with the alternating-current voltage. Hence it was only when the alternating-current voltage was applied that a change of zero was produced. In most cases this could not be compensated beforehand. Castor oil was not suitable for use in oscillographs, as it became acid and conducting under high voltages ; well-filtered paraffin had not this defect.

Mr. G. L. Addenbrooke said that if castor oil free from dust and moisture were used he did not think oscillograms with the instrument would be affected perceptibly by action in the oil at 40 periods or higher.

Prof. Koto, in reply, said that the deviation of the strips from the centre was a cause of the change of zero, if a large polarising voltage were applied. To suppress this effect, the authors made the distance between the two field plates, and consequently the distance between the strips and the plates, sufficiently great to make the inevitable slight deviation from the centre a very small percentage of the distance between the strips and the plates, and consequently this deviation from symmetry would cause no appreciable "out of balance" of the forces due to the polarising voltage acting upon the strips and effecting this change of zero.

Electrolysis and Armoured Concrete.—The New York correspondent of *Der deutsche Steinbildhauer* states that symptoms are multiplying which tend to show that the American enthusiasm for "skyscrapers" is greatly weakening. It is becoming clearer every day that the massive armoured concrete buildings contain within themselves serious hidden dangers, and it is significant that a jury of specialists is now in session in New York to examine these questions and to elaborate proposals for the limitation of such structures. The most serious risk feared in connection with the skyscraper building is the electrolysis of the steel framework and the destruction of the steel supports by the electric current. With the unlimited use of electric installations in these buildings, it is said, the avoidance of stray currents is impossible. Specialists in Chicago reckon, after close investigation, that the destruction of steel in a skyscraper building proceeds at the rate of 1 lb. per hour. This statement is rather vague, and we believe that under normal conditions there is little risk of damage to reinforced concrete by electrolysis, which cannot take place except in damp situations and where stray currents have direct access to the reinforcing rods.

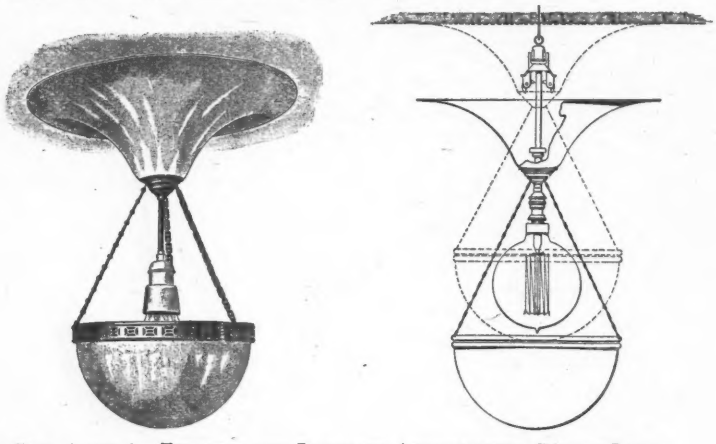
NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Benjamin Steel Reflectors.

The Benjamin Electric, Ltd., 117, Victoria Street, S.W., announce that they have developed a special interior surface, which will in future be applied to all Benjamin steel reflectors, and which is obtained by a transparent coating which forms a simple protective surface over the aluminium reflecting medium. This allows reflectors so treated to be cleaned very easily, and this surface will be referred to as the "Ezekleen" reflecting surface; the ordinary aluminium surface shows depreciation in efficiency after a short service, which is due to the dirt particles, which it is impossible to remove as they get into the pores of the aluminium.

The Saturn Lamp.

To meet the demand for fittings for semi-indirect lighting, the Electrical Engineering and Equipment Co., Ltd., of 109, New Oxford St., W.C., have just placed on the market the "Saturn" lamp. This has a number of advantages over similar devices on the market, the principal one being that the bowl and reflector are fitted with a special automatic raising and lowering device similar to that employed in the firm's arc-lamp contact gears. This allows of the bowl being lowered clear of the lamp for cleaning purposes, the difficulty of cleaning the bowl and the risk of breakage of the lamps being one of the drawbacks of existing fittings. The possibility of lowering the reflector on the centre stem also makes the erection of the fitting very simple; a further advantage is that the centre stem does not go through the bottom of the bowl—which method of support produces a black spot immediately under the fitting—but is supported on chains. The new lamp is illustrated in figs. 1 and 2.



Figs. 1 and 2.—Exterior and Lowering Arrangement, Saturn Lamp.

A Knife-Polishing Machine.

The Atlas Manufacturing and Trading Co., of Revenue House, 7 and 8, Poultry, E.C., who are the sole licensees for its sale in this country, on the Continent, and in the Colonies, have recently put on the market the Dilg Defiance cutlery polisher—an electrically-driven machine with a capacity of 800-1,000 knives an hour, and an attachment for polishing forks, &c. The machine is fitted with a 110 or 220-volt motor geared to the knife polisher, which simultaneously cleans the sides, back and shoulders of the blade. An additional spindle containing a grinding wheel, buffing brush for silverware, and a brush for polishing hollow-ware can be attached, the complete machine then occupying 28 in. × 13 in. table space. The starting switch is incorporated with the motor, and the machines weigh roughly from 50 to 55 lb. each. They are in extensive use at hotels, restaurants, &c., and on passenger steamships such as those of the Hamburg-America Co.

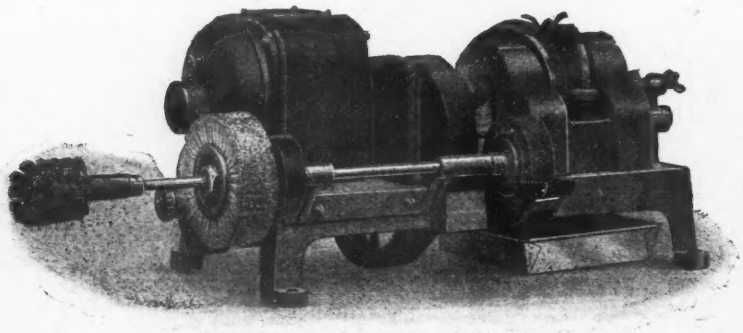


Fig. 3.—Dilg Electrical Cutlery Polisher.

The Lighthouse Radiator.

We illustrate in fig. 4 the Lighthouse radiator, a low-priced heater, with an easily-renewable element, which is guaranteed for 12 months.

It is finished with a dead black body and polished copper base and top; the heating element runs at red heat, giving a cheerful glow through the openings and warming the air by convection.

Fig. 4.—Lighthouse Radiator.

The heaters, which are manufactured by The Lighthouse Radiator Co., Ltd., of Woking, and for which Messrs. P. L. Dwyer & Co., of 66, Victoria Street, S.W., are wholesale agents, are suitable for domestic and office use, and have been supplied to several leading supply authorities.

Insulated Lampholder.

We have received from the British Central Electrical Co., Ltd, of Rosebery Avenue, E.C., a sample of their latest pressel insulated lampholder, which meets every requirement of the Home Office Regulations. In it is embodied a simple push-pattern switch movement which can be actuated with one hand, thus reducing to a minimum the strain on the flexible at the cord grip. The switch consists of an insulating block carrying a contact strip, which is moved across a pair of vertical plunger terminals by the push movement; on the other side of the porcelain interior carrying these terminals, are the ordinary lamp socket terminals.

Fig. 5.—Insulated Lampholder with Push Switch.

The arrangement is simple and compact, and provides a smoothly working switch, while the outer cover is fireproof and of robust proportions.

"Velveduct"—a New Conduit.

After continued experiment, The General Electric Co., Ltd., have been able to put on the market a drawn tube, similar in quality and appearance to solid-drawn or seamless conduit, but at

a price very little higher than that of welded or brazed tube. The chief points of superiority, which have maintained the employment of the higher-priced seamless conduit, have been the facility with which it could be bent or set cold, and the freedom from internal fins and burrs, such as are sometimes found in the cheaper tubes. The processes employed in the production of "Velveduct" entirely prevent the possibility of the tube having any internal irregularities, and it can be set cold as easily as the seamless tube. "Velveduct" is stocked with both the standard electric thread and gas thread, and can be used with all the varieties of screwed accessories illustrated in the conduit catalogue, issued by the General Electric Co., Ltd.

Edison Screw Cap Lamp.

The Edison & Swan Co., of Ponder's End, have recently introduced a miniature form of tungsten lamp with a cone-shaped bulb, in voltages from 100 to 125, and from 10 to 40 watts. It is a lamp largely in demand abroad, having a bulb of small dimensions, viz., $1\frac{1}{16}$ in. diameter, and 4 in. overall length approx., so that a much larger number per standard case can be shipped, and it has been

Fig. 6.—Miniature Tungsten Lamp, with Screw Cap.

sought after by exporters because it effects a saving in freight. An Edison screw cap is provided.

The company has also introduced the "Royal Ediswan" traction lamp, which is made in the popular small pear-shaped bulb, and possesses great strength with long life. The drawn-wire filaments are short and rigid, and withstand vibration well; the lamps are all carefully selected for series burning before leaving the works.

An Electrical Vibrating Grindstone.

Messrs. E. Siegmund, of Zurich, have recently placed a novel grinding tool on the market. This is shown in fig. 7, and differs from the ordinary revolving wheel, in that the grindstones are given a very rapid short-stroke to-and-fro motion (vibration) in a horizontal plane.

The driving motor runs at 1,400 r.p.m., and the rapid vibration

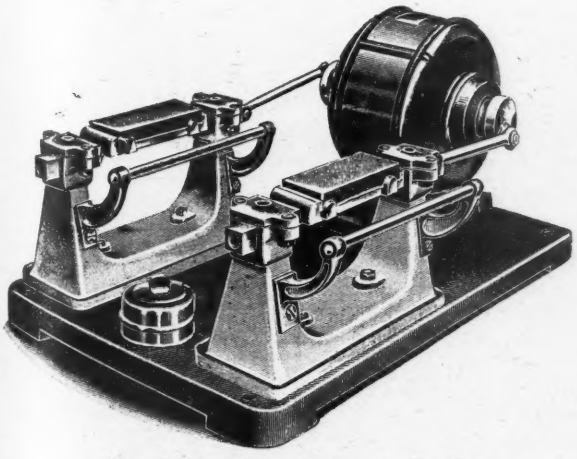


Fig. 7.—Electrical Vibrating Grinder.

of the stone enables a very short range of motion to produce the necessary attrition in an astonishingly short time.

Provision for two true grinding surfaces is made—one for roughing and the other for finishing. The stones are held in position by small wedges, and are easily replaced by fresh stones, or by any other form of polishing surface. Great care is taken in balancing the machine, so that it runs quite noiselessly, and an ingenious cushioning arrangement is employed to avoid all shocks at the ends of the stroke. The power taken is about one-tenth h.p.—*E.T.Z.*, October 30th, 1913.

INSTITUTION OF ELECTRICAL ENGINEERS.

The opening meeting of the session of the Yorkshire Local Section was held on Thursday, last week, at the Hotel Metropole, Leeds, and took the form of an inaugural address by the chairman (Mr. W. B. Woodhouse), followed by a smoking concert. There was a very large attendance of the members. The following is an abstract of the address:—

The valuable properties and constituents of coal are many; in addition to the heat derived from its combustion there may be obtained ammonia, tar, pitch, creosote, benzol, cyanides, sulphur compounds and other products. The value of these chemical products is enormous and the process of burning coal in its raw state wastes them entirely. The most inefficient use made of coal is to burn it in the domestic fireplace. When consumed under steam boilers and utilised to produce steam power, the case is little better; the best modern practice accounts for only 15 per cent. of the heat energy and the average practice for not more than one-half of this.

The heat value of a ton of coal is some 30 million heat units. If it is burnt to produce electricity, there its value ends; if it is distilled in the manner adopted by gas engineers some 20 per cent. of the heat energy is made available in the gas produced, and some 60 per cent. left in the resultant coke, but in addition tar, ammonia, and other valuable products, are released.

The published figures of the costs and receipts of a large gas works are instructive. The cost of manufacture, excluding capital charges, amounts to 22·89d. per 1,000 cb. ft. of gas made. The receipts consist of:—

Gas	... ...	25·55d.	per 1,000 cb. ft. of gas.
Coke	... ...	7·46d.	" " "
Tar	... ...	2·03d.	" " "
Ammonia	...	2·57d.	" " "

These figures are sufficient evidence of the value of the process adopted. The process of distillation, while giving a maximum yield of gas, does not make the best possible use of the coal. In view of the demands for the various coal products, it is obvious that there may be room for variation of the method of carbonisation dependent on the relative values of and markets for the various products.

The development of the principle of carbonisation on broader lines has come from the needs of the iron and steel trades, the largest users of coke. Furnace and foundry coke in the past was produced in bee-hive ovens, wastefully; the evolution of the by-product oven has, however, changed all this, and now, in addition to producing coke for the ironmaster, the mining engineer produces gas, tar, ammonia, benzol and other valuable substances, and so makes efficient use of the raw material, including, incidentally, a greater yield of coke.

Whatever process is adopted for the extraction of the valuable products from coal, that process can only be carried on economically on a large scale, and therefore the distribution of coal energy, whether in the form of solid fuel, gas or electricity, must be on a large scale also. In other words, the essential centralisation of coal carbonising plants implies distribution of light, heat and power over large areas and in large quantities, and under such conditions electrical means are by far the most economical.

Up to the present time electricity has been generated in central stations by methods akin to those adopted by individual power users, only more economically due to the advantages of centralisation. That is to say, a public supply is merely a co-operation of users to take advantage of certain economies.

The next step forward is a further co-operation of the electricity supply undertakings with other processes involving the use of coal; the first example in Yorkshire of co-operation of this kind has recently been set to work at the coke ovens of the Old Silkstone Collieries, in conjunction with the Yorkshire Electric Power Co. In this case the surplus gas from the coke ovens produces continuously day and night some 2,000 kw. which, by working the station in conjunction with their general system, the power company supply to their customers. Such an arrangement as this is only possible on a large scale, but its economic advantages are obvious.

So long as no other means of heating and cooking were available, the distribution of coal to dwelling-houses was inevitable, but with a recognition of the folly of burning coal, the alternative of burning coke or smokeless fuel (semi-coke) must increase, and if no other means of distributing energy were available, would eventually entirely alter the present practice.

Now regarding only convenience and cleanliness, the use of gas presents advantages over that of coke, and the use of electricity over both. Domestic labour must be reduced, the utmost cleanliness must be established, and the healthiest conditions maintained. On these three points electricity is superior as a means of distribution. But in regarding cost, one must recognise that the production of coke or semi-coke will be in the future enormously increased, and unless the demand increases with production, its price will fall to such a point that in many cases its cheapness will outweigh the advantages of its competitors.

Not to look too far ahead, then, one may safely conclude that a demand will exist for solid fuel in the dwelling house, marking a transition stage from coal to electricity. In the same way, dependent on the laws of supply and demand, coal gas and producer gas will find a place in the general scheme of distribution. But as for the production of electricity on scientific lines, gas, coke, oil and tar can all be used as fuel, there can be little doubt that domestic needs will be principally met by the supply of electricity.

For power purposes electricity generated in the primitive manner adopted by the individual power user is steadily displacing all other methods, and this because, in addition to its convenience, it can be supplied more cheaply than power can be produced in isolated plants. That it can be so supplied is due to the advantages of centralisation already mentioned; if we add the advantages of co-operation with other processes in extracting the valuable properties from coal, the advantages become enormously increased.

In the future distribution of energy, electricity must take a large, and I believe, predominating part, but its progress is not solely controlled by engineering and chemical problems such as those to which I have referred; one must also consider the legislative and financial conditions under which the supply of electricity must be developed. Technical difficulties may be overcome by individuals, but legislative obstacles will only be removed if the electrical industry moves the public to call for it.

The first step to be taken is to encourage a better understanding between the State departments, the municipalities, the power companies and others engaged in the business.

The legislation affecting the public supply of electricity has not been helpful to development on broad lines, and State control has, generally speaking, been repressive rather than helpful. The economical development of our natural resources deserves and requires a helping hand, and the utilisation of coal might well be regarded as equally worthy of State support as, say, the London Docks.

The veto of local authorities, the power of purchase granted by the Electric Lighting Acts and the general influence of municipal trading have not made for progress.

As a case in point, the fear in municipal minds of the effect of the competition of electricity on their gas undertakings may be instanced. Anyone familiar with the development of electric supply in this country knows that this has been one of the most potent reasons for the acquisition of electric lighting powers by local authorities, and where both gas and electricity supply are controlled by the local authority, future developments may anticipate similar opposition. Broadly speaking, the local authorities are afraid of the Power Companies, the gas engineers of their electrical brethren, and so on all round. The time has come for this partisan spirit to be swept away and for the problem to be dealt with on broader lines altogether; unless this is done progress must lag and the country suffer.

State control should aim at assisting those engaged in the industry to obtain the best results. Municipal spirit and local pride should not deny the advantages of new developments as they arise to the ratepayers, nor a share of the benefits to those individuals who by their enterprise develop more efficient conditions. Private enterprise, while best fitted to break new ground, would yet be assisted by the financial support which could be given by the State and the municipalities.

Where municipal trading is indulged in directly, the advantages of cheap money such as municipalities can raise on the security of the rates, are great, but the moral obligation not to speculate with such money is great also, and the natural effect of such trading is to discourage new developments which might depreciate undertakings already financed with ratepayers' money.

The best results can probably be obtained by a compromise; let private enterprise continue to develop improved methods, and if the municipalities desire to exercise some control of the developments, then let them assist in the finance.

Some years ago, in addressing this Institution, I suggested that municipalities might subscribe to debenture issues of public utility companies with advantage to all parties. The steadying effect of municipal capital would yet not act as a brake, and with their financial interest some measure of control would naturally be exercised.

In a public supply, service at the lowest rates can only be given if money is cheap, and cheap money demands adequate security. If the investor can be assured of State control of public utilities, coupled with reasonable protection, just regulations and a measure of financial support, we need have no fears for the future progress of electricity supply in this country.

MR. T. ROLES moved a vote of thanks to the chairman. He said that there was no doubt that if the various bodies who were supplying electricity could only be organised in such a way that they could be brought into line, the work of electricity supply would progress very much more quickly than it did at present. There were many small municipalities supplying electricity which, he thought, would do better to consider whether they could not combine with others or with a power company or some large municipality to put down a central station, and so cheapen things all round. The question of the utilisation of by-products of coal was a very important one. The gas people were now coming down to a point at which they said that they could turn out gas itself at about 4d. per 1,000 cb. ft., and so valuable were the by-products that in some cases they said they could put the gas into the gas-holder free of cost. They also had to consider waste products. There was the gas from blast furnaces, and a good deal could yet be done with the steam exhausted from turbos of 40 to 50 lb. pressure.

The vote of thanks was seconded by MR. YERBURY, and the Chairman briefly replied.

THE BRITISH STANDARD SPECIFICATION FOR CONSUMERS' ELECTRIC SUPPLY METERS.

By S. H. HOLDEN, M.I.E.E.

(*Paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS, *at Birmingham, November 12th*, 1913.)

THE British Standard Specification No. 37 was published in 1907. In the opinion of the author this specification has not so far taken the position in relation to the electricity meter industry which it is desirable that it should do; and he proposes to make certain suggestions which it is hoped will tend to the greater usefulness of the above specification.

Manufacturers have much to gain by a general adoption of a standard specification among their customers. The preparation of specifications for electricity meters is quite special work, and it is curious to notice how frequently engineers of ability are betrayed into ridiculous mistakes when they attempt to draw up such a specification.

A further advantage of the general adoption of the Standard Specification is that foreign and Colonial purchasers, buying either direct or through merchants at home, would know that if a meter complied with the specification it was the best obtainable, and on that account standard English-made meters should enjoy a readier sale and command better prices than those supplied by competing manufacturers.

If consulting engineers and large purchasers were to adopt the same specification they would save themselves much unnecessary work, and would help to keep down the cost of meters to their clients by avoiding a multiplicity of patterns.

In the original Standard Specification no attempt was made to differentiate between alternating and continuous-current meters. It is desirable, however, to do so, as it is possible to obtain greater range and accuracy with an alternating-current meter having a pressure coil than with a continuous-current ampere-hour meter; and the best obtainable performance should be specified for each class of meter.

The following alterations and additions to some of the clauses, with one or two new clauses, are now offered for consideration and discussion.

Clause 2. "The following capacities, in amperes, shall be recognised as Standard: 3, 5, 10, 25, 50, 75, 100."

The 2½-ampere size is preferable to the 3-ampere size for single-phase meters. The list of sizes should be increased by adding 150, 200, 250, 300, 400, and 500 ampere. The 75-ampere size does not appear to be really necessary.

Clause 3. "The meter shall be contained in a substantial dust-tight metal case of sufficient strength . . . ."

After the word metal case it is proposed to insert the words "of cast-iron or pressed steel." Cases of soft metal or sheet joined together are not used on the highest class of meters.

Clause 6. This clause deals with the terminal box, but only specifies the size of the pressure-circuit terminal. It is therefore proposed to add "the main terminals shall each have two clamping screws. The depth of the hole into which the cable is inserted shall be at least twice its diameter. The following shall be the diameters of the holes for the cables: 10-ampere, 0·22 in.; 25 ampere, 0·32 in.; 50 ampere, 0·375 in.; 100 ampere, 0·435 in.; 150 ampere, 0·5 in.; 200 ampere, 0·6 in.; 250 ampere, 0·7 in.; 300 ampere, 0·8 in.; 400 ampere, 0·9 in.; 500 ampere, 1 in.

Clause 10. "The meter shall have a suitable place and means upon the front of the case adapted to receive and secure a label to be provided and fixed by the purchaser or his representative. The purchaser's label shall be a rectangular sheet 2 in. long, ½ in. wide, and not more than $\frac{1}{32}$ in. thick."

To this should be added: "It shall be affixed by two rivets, and the manufacturer shall provide two holes $\frac{1}{8}$-in. diameter and 1¾ in. apart in a suitable position for this label." It is doubtful, however, whether the size specified for the purchaser's label is large enough.

Clause 11. "The dial plate shall indicate the total consumption directly in units, either by means of a number of index hands each travelling round a circular dial on which divisions are marked and figured to indicate units, tens of units, &c., or by means of counter wheels on which digits are marked to indicate units, tens of units, &c., provided that only one digit on each counter wheel shall be visible at a time.

The addition suggested to this is: "If the latter is adopted, the figures on all the wheels shall spring suddenly into position with the exception of those denoting units, which may move at a uniform speed." A counter which can allow of any doubt as to which of two figures is to be read on the higher multiples is inadmissible.

In Clause 12, the expression "kilowatt-hour" would be better than "unit," and the number of testing dials should be specified. It is therefore proposed to add: "Meters having a capacity of 2 KW.-hours per hour and under to have two testing dials reading $\frac{1}{10}$ and $\frac{1}{100}$ KW.-hour per division respectively. Meters above this capacity and up to 200 KW.-hours per hour to have one testing dial reading $\frac{1}{10}$ KW.-hour per division.

Clause 16. "The main circuit of the meter shall be so constructed that the total loss of power at full load, as measured at the main terminals, shall not exceed 15 watts, subject to the further restriction that the loss of pressure in the main circuit at full load shall not exceed 2 volts in any meter."

As this specification does not apply to electrolytic meters, the

2-volt limit is far too high ; ¾-volt is ample. Most engineers prefer to be furnished with definite figures for each size of meter for the fall of potential at full load ; a schedule is therefore suggested, from 0·75 volt for the 2½ or 3-ampere size to 0·075 for the 150-ampere size and upwards.

Clause 17. "The pressure circuit, if any, of the meter shall be so constructed that the total power spent in it shall not exceed 4 watts for each 100 volts of pressure."

The consumption in the pressure circuit of single-phase meters should not exceed two watts, and for continuous-current meters 7 watts, at the declared pressure, provided this does not exceed 650 volts.

Clause 19 deals with starting currents. A first-class single-phase meter should start with ½ per cent. of its full-load current at a power factor of unity. A continuous-current ampere-hour meter should start with 0·05 ampere if of 10-ampere capacity or under, and with ½ per cent. of full load, if over 10-ampere capacity.

Clause 20 relating to the error of a meter appears to be insufficiently rigorous and too clumsy for ordinary use. Alternating-current meters can easily be made accurate within 2 per cent. from one-twentieth full load to full load ; and the same applies to continuous-current ampere-hour meters except that the lower limit should not be less that half an ampere. No guarantee of accuracy above or below these limits should be asked for or given.

Clauses 25, 26, 27, relating to variations of pressure, frequency and power factor, all appear to lack definiteness, as the author has found that different interpretations are put upon them. The most usual interpretation leads to the absurdity that if, say, a meter is 2 per cent. slow at normal voltage and a 10 per cent. rise of pressure makes it correct, it must be rejected because the rise of pressure has caused more than 1 per cent. variation, while if the same rise of pressure makes it 1 per cent slower (that is, 3 per cent. total error) it will be accepted. It is suggested that the words "shall not cause an error" be altered to "shall not increase an error."

Variation of wave-form is not dealt with in the Standard Specification. For the sake of completeness it is suggested that a clause be inserted to the effect that a variation of wave-form of 10 per cent. from a true sine curve at any point shall not increase the error of the meter by more than 1 per cent.

Slight additions to the specification would make it cover polyphase meters ; and in view of the large number of such meters in use their inclusion is very desirable.

In conclusion, the author suggests that the Institution should urge the Engineering Standards Committee to publish, as soon as possible, a revised and completed specification for electricity meters, and that with a view to its wider use and circulation, the price should be reduced to 1s. per copy, in order that manufacturers may be able to include copies with their tenders. Those purchasing or specifying meters should also be urged to make use of the full specification, without additions as far as possible, especially when meters are purchased for export. And some distinguishing mark should be placed upon meters which are sold as complying with the British Standard Specification.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"W. H. B." writes :—"Following the very interesting reply given by your legal correspondent to 'Electric Supply' on page 77 of your current issue, I should be glad if he would favour me with his opinion on the following :—

"(1) It is proposed to supply electricity to several works—all adjoining—which are situated in the areas of two supply authorities. Each authority wishes to supply the works in its own area. The price required by one authority is lower than that of the other, although the factory requirements are practically the same in each case. Could the owners legally get over the difficulty by laying down motor-driven generators in a works within the area of authority A (who would supply at the lower price), and use the current produced therefrom in the works within the area of authority B ?

"(2) In the event of this scheme being carried out, who would really generate the current used in B's territory—the owner of the motor-generators or authority A ? If it be granted that the current is generated by the owner, I presume that authority B would have no voice whatever, in regard to the supply to the factories situated in its own area."

* * The first question propounded is one which has frequently arisen in one form or another. In the first place it is clear, having regard to Sec. 6 (1) of the Electric Lighting Act, 1909, that the absence of consent will prevent the arrangement being carried out unless the Board of Trade is of opinion that consent is unreasonably withheld. It is said in a well-known text-book that "the section would include within its scope premises which can be more conveniently served by a neighbouring undertaking than by the undertaking covering the area in which the premises are situated, and premises situated in a district covered by no Electric Lighting Act or Order." There has, as yet, been no decision or case upon the section. Now, as to the suggested means of evading it. It appears to the writer that the method would be a mere device for driving a "coach and four" through an Act of Parliament, and the Courts would hold this to be so. Energy in one form or another would have to pass from out of a supply area to be utilised elsewhere. To permit energy so to pass would be to evade the express provisions of the Act.

As to (2) it is clear that the current would be used and consumed in an area other than that in which it was generated.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

Amendments.

SOUTH AFRICA.—H.M. Trade Commissioner in South Africa reports that the Collector of Customs on being asked to give a definition of the terms "bought in the ordinary manner" from the manufacturer or supplier "in normal quantities" for purposes of declaration of value for duty purposes, interpreted these terms to mean that duty will be levied on the current value of the goods bought "in a similar manner" from the manufacturer or supplier "in similar quantities." The Collector further intimated that the certificate which is required can be written across the invoice, stating that the prices enumerated thereon are current values for home consumption and, therefore, dual columns of figures are not necessary. In the event of the export prices of a commodity being lower than the home consumption current value, it will be necessary to have the dual columns of the prices for the articles. In the case of goods manufactured solely for the South African market, this fact must be clearly stated on the invoices.

ITALY.—The Customs authorities have decided that brass wire coated with copper of a thickness exceeding one half millimetre shall be dutiable at the rate of 20 lire per 100 kg., and that air suction electric ventilators are to be dutiable at the rate of 25 lire per 100 kg. (lire = 9·16d., kg. = 2·204 lb.).

MEXICO.—The Board of Trade have received telegraphic information to the effect that by a Mexican Presidential Decree of October 18th, the Customs duties on goods imported into Mexico were increased by 50 per cent., this percentage increase to be calculated on the sum of the Tariff rates of duty and the 10 per cent. surtax on those rates which was imposed on February 16th last. The rates of duty inscribed in the Tariff have now, therefore, to be increased by 65 per cent. in order to arrive at the total duty leviable. The new decree was to come into force on October 28th, and under it 10 per cent. discount is to be allowed on all certificates for payment of duties purchased prior to November 6th. The certificates referred to are to be purchased from the Government by currency at face value, and all duties have to be paid in this way.

Publication of Contract Prices.—The Stores and Contracts Committee of the L.C.C. recently made the understated recommendations respecting the reporting of values of stores contracts, but two members of the Council put down an amendment to refer the recommendations back :—

"It has been the practice when recommending or reporting the acceptance of tenders for stores, &c., to give where possible the value to the nearest £, based on the estimated quantity required, of each contract. The individual prices for the various items in the schedule are not given, only the total estimated value for the contract period of all the items allotted to each accepted tenderer. It has, however, been represented to us that in cases in which a tender is accepted for one or two items only the publication of this information may, and frequently does, disclose to other tenderers the actual prices quoted, although this is not the Council's intention. There is no doubt that the disclosure of prices quoted for stores operates to the Council's disadvantage, and we propose, therefore, in future, that, in cases in which the publication of the estimated value of a contract may lead to the disclosure of the individual price or prices quoted, the particulars, instead of being printed in our report, shall be laid on the table for the information of members. Under this arrangement exactly the same information as at present will be available for members. The course proposed has accordingly been followed in the statement, submitted to the Council on October 21st, 1913, and referred to in the first paragraph of this report, of tenders accepted during the summer recess. We recommend that the following be a regulation with regard to the stores service :—In cases in which the publication of the estimated value of a contract for stores, &c., may lead to the disclosure of the individual price or prices quoted, the particulars, instead of being included in the report of the Stores and Contracts Committee, shall be laid on the table for the information of members."

Inland Waterways.—The Birmingham City Council has adopted a resolution approving of the recommendations of the Royal Commission on Inland Waterways for the appointment of a central Waterways Board to acquire and improve the four waterways known as "The Cross," the centre of which is close to Birmingham. The Council expressed its willingness to bear part of the cost of the improvements.

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

24,274. "Electric fittings specially adapted to fuses." V. HOPE. October 27th.

24,275. "Trolley pointer guide for electric tram-cars." G. F. FRENCH. October 27th.

24,305. "Rotary converter with commutating poles." AKT. GES. BROWN, BOVERI, ET CIE. October 27th. (Convention date, June 30th, 1913, Germany.) (Complete.)

24,306. "Conversion or transformation of electric current." A. SCHERBIUS. October 27th. (Convention date, October 25th, 1912, Germany.) (Complete.)

24,312. "Search-lights or projectors." SIEMENS-SCHUCKERTWERKE G.M.B.H. October 27th. (Convention date, October 26th, 1912, Germany.) (Complete.)

24,327. "Magnetising-machine." S. C. NEWTON. October 27th.

24,333. "Telephone systems with party-line service." SIEMENS & HALSKE AKT. GES. October 27th. (Convention date, January 4th, 1913, Germany.) (Complete.)

24,337. "Rotary converters with commutating poles." AKT. GES. BROWN, BOVERI, ET CIE. October 27th. (Addition to 24,305/13. Convention date, September 20th, 1913, Germany.) (Complete.)

24,338. "Means for effecting the excitation of automatically reversible battery boosters." W. E. HIGHFIELD. October 27th.

24,347. "Process for heating electrical furnaces, more particularly applicable to the manufacture of aluminium nitride." SOC. GENERALE DES NITRURES. October 27th. (Convention date, December 14th, 1912, France.) (Complete.)

24,355. "Magnetic separators." FRIED. KRUPP AKT. GES. GRUSONWERK. October 27th. (Convention date, November 27th, 1912, Germany.) (Complete.)

24,419. "Electric toasters." C. P. MADSEN. October 28th. (Convention date, October 28th, 1912, United States.) (Complete.)

24,422. "Sockets for incadescent lamps." C. A. VETTER. October 28th. (Complete.)

24,441. "Electric signalling apparatus for railways." F. MACKINTOSH. October 28th.

24,450. "Arrangement for the automatic protection of air-cooled electrical machines against damage through ignition of the air-filters." ALLGEMEINE ELEKTRICITATS GES. October 28th. (Convention date, January 29th, 1913, Germany.) (Complete.)

24,458. "Utilization of oscillating-current energy." J. W. LEE and J. L. HOGAN, Jun. October 28th. (Convention date, November 16th, 1912, United States.) (Complete.)

24,459. "Circuit arrangements for telephone installations with semi-automatic working." SIEMENS & HALSKE AKT. GES. October 28th. (Addition to 6,664/13. Convention date, October 31st, 1912, Germany.) (Complete.)

24,471. "Electric batteries." F. S. B. DE MELLO. October 28th. (Convention date, December 4th, 1912, Brazil.) (Complete.)

24,472. "Electric welding-apparatus." J. M. YOUNT, T. FINIGAN, and E. S. BRANNAMAN. October 28th. (Complete.)

24,496. "Electric hand lamp or torch." R. GLADSTONE, Jun. October 29th.

24,515. "Locking-device for electric lamps." J. GORDON and J. GORDON. October 29th.

24,516. "Improvements in turbine and centrifugal pumps to prevent overloading of electric or other motors, driving arrangements, and the like, used for driving such pumps." J. TAYLOR and L. W. WEIL. October 29th.

24,524. "Magnetic locking and unlocking of miners' safety lamps." J. H. ROTHWELL, J. ROBERTS, and W. H. ROBERTS, trading as J. H. ROTHWELL & Co. October 29th.

24,525. "Caps or mouthpieces for telephonic transmitters and other sound instruments." A. MARR. October 29th.

24,559. "Electrolytic apparatus." J. T. NIBLETT. October 29th.

24,560. "Electrolytic apparatus." J. T. NIBLETT. October 29th.

24,565. "Element to be used in connection with electrically heating toasters, grills, roasters, and the like, also stoves and ovens for heating air, water, and the like." S. E. FOSTER. October 29th.

24,569. "Porous containers or diaphragms for voltaic cells." J. G. LUCAS. October 29th.

24,586. "Electric ceiling-roses." G. MARKT. October 29th.

24,593. "Electric switches or circuit-breakers." F. B. HOLT and H. SMITH. October 29th.

24,594. "Electric switches or circuit-breakers." F. B. HOLT and H. SMITH. October 29th.

24,620. "Electrical alarm for warning engine drivers when passing a signal standing at danger." L. L. HARTMANN. October 30th.

24,657. "Thermo-electric generators." P. FERRA. October 30th.

24,673. "Conversion of alternating electric currents." A. SCHERBIUS. October 30th. (Addition to 24,212/13. Convention date, October 31st, 1912, Germany.) (Complete.)

24,686. "Headstocks of electrically-driven lathes and other machine tools." H. KIENZLE. October 30th. (Divided Application on 12,235/13, May 26th.) (Complete.)

24,688. "Magnetic chucks." T. L. JONES. October 30th.

24,699. "Electric liquid heaters." E. A. RAVES. October 30th. (Addition to 14,562/13.) (Complete.)

24,720. "Arc lamps." H. AYRTON. October 30th.

24,754. "Electric re-fills." A. E. SEGNITZ. October 31st.

24,755. "Means for use in the manufacture of telegraph and like insulators." F. HANCOCK. October 31st.

24,770. "Electric arc lamps." F. E. ATHERTON. October 31st.

24,777. "Connections and fittings for electric conduits." C. BIRCH. October 31st. (Complete.)

24,809. "Mounting switches and other electrical apparatus in boxes." A. W. SCLATER. October 31st. (Complete.)

24,817. "Production of electric current." D. SUCHOSTAWER. October 31st.

24,826. "Arrangement for the heating of liquids by means of an electric lamp." G. H. M. DEBONNIERE. October 31st. (Complete.)

24,827. "Process for working a radiator heated by gaseous, liquid, or solid fuel, or by electric current or steam." H. FRANK. October 31st. (Addition to 20,241/11.) (Complete.)

24,833. "Electric rotary indicator." MCKENZIE & HOLLAND, LTD. and W. A. PEARCE. October 31st.

24,845. "Automatic switches or cut-outs for use in lighting systems on motor, railway, or other vehicles." D. V. L. FELLOWS. October 31st.

24,850. "Electric furnaces." I. RENNERFELT. October 31st. (Convention date, December 5th, 1912, Sweden.) (Complete.)

24,869. "Apparatus for shaping articles of pottery." F. HANCOCK. November 1st.

24,871. "Variable candle-power incandescent electric lamp and switch." W. G. RHODES. November 1st.

24,882. "Apparatus for autographic and facsimile telegraphy." R. W. ANSTEY. November 1st.

24,898. "Apparatus for electrically lighting road vehicles and the like." E. P. PRIOR. November 1st. (Complete.)

24,899. "Construction of electric snap-action switch." E. M. WILDEY. November 1st. (Divided Application on 1,471/13. July 18th.) (Complete.)

24,900. "Carbon electrode holders." A. SCHWARZ (Firm of.) November 1st. (Convention date, January 20th, 1913, Germany.) (Complete.)

24,907. "Electrical interrupters or vibrators." F. KNABL. November 1st.

24,911. "Electrostatic machines." E. OPPEN. November 1st. (Convention date, October 14th, 1913, Germany.) (Complete.)

24,927. "Telephone exchange systems." WESTERN ELECTRIC CO., LTD. November 1st. (Franklin Tuthill Woodward, Belgium.)

24,928. "Switching apparatus for telephone exchange systems." WESTERN ELECTRIC CO., LTD. November 1st. (Franklin Tutgill Woodward, Belgium.) (Complete.)

24,936. "Galvanometers, voltmeters, ammeters, and like instruments." GAMBRELL BROS., LTD., and A. ONWOOD. November 1st.

24,939. "Galvanometers, voltmeters, ammeters, and like instruments." GAMBRELL BROS., LTD. and A. ONWOOD. November 1st. (Addition to 17,733/13.)

24,942. "Submarine audible telegraphy and signalling." E. KLUPATHY and C. BERGER. November 1st. (Addition to 27,144/10. Convention date, November 3rd, 1912, Hungary.) (Complete.)

24,943. "Electric torches." G. HITZELBERGER and NEW BRITISH EVER-READY CO., LTD. November 1st. (Complete.)

24,944. "Electric pocket lamps." G. HITZELBERGER and NEW BRITISH EVER-READY CO., LTD. November 1st. (Complete.)

24,949. "Means for cutting out and reinserting the resistance in controllers of the drum type." E. M. MARVIN. November 1st.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps.)

1912.

ALTERNATING CURRENT COMMUTATOR MOTORS. British Thomson-Houston Co. (Allgemeine Elektricitats Ges.) 20,849. September 12th.

ILLUMINATED SIGNS. A. W. Beuttell. 22,990. (Cognate Application 8189/13.) October 8th.

INDICATOR FOR LAMPS FOR MOTOR VEHICLES. G. W. Booth, J. F. Booth and A. H. Wilkinson. 23,211. October 11th.

ELECTRICAL APPARATUS FOR CONTROLLING ELECTRIC MOTORS FOR RAILWAY POINTS OR FOR OTHER PURPOSES. J. H. Gath. 23,279. October 11th.

CUTTERS FOR METAL ELECTRIC CONDUITS. L. H. Marlor, T. G. Hann and J. T. Foster. 23,607. October 16th.

MOTOR CONTROLLING SWITCHES. W. E. Lake (Soc. Anon. Du Temple.) 23,669. October 16th.

INCANDESCENT ELECTRIC LAMPS AND HOLDERS THEREFOR. A. W. Beuttell. 23,774. October 17th.

DRIVING GEAR FOR DYNAMO MACHINES FOR LIGHTING VEHICLES FROM AN AXLE THEREOF. Julius Pintsch Akt. Ges. 23,854. October 18th. (November 1st, 1911.)

ELECTRICAL HEATING DEVICES. A. F. Berry. 23,860. October 18th.

ELECTRICAL RELAYS. S. G. Brown. 24,043. October 31st.

METHOD AND MEANS FOR THE INTENSIFICATION OF INTERMITTENT ELECTRO-MAGNETIC OR LIKE IMPULSES. A. M. Nicholson. 24,136. October 22nd.

ELECTRIC ORGANS AND LIKE MUSICAL INSTRUMENTS. J. R. C. Gale. 24,142. October 22nd.

APPARATUS FOR LIGHTING AND EXTINGUISHING GAS FROM A DISTANCE. G. Thommel. 24,165. October 22nd.

FLUID METERS. British Thomson-Houston Co. (General Electric Co.). 24452. Oct. 25th.

DRIVING OF MAGNETO-IGNITION DEVICES. D. H. O'Flaherty. 25531. Nov. 7th.

REFLECTORS FOR ELECTRIC INCANDESCENT LAMPS. C. Damey. 27276. Nov. 27th.

CONTROL OF ELECTRIC MOTORS. F. E. Case. 27837. Dec. 3rd. (Dec. 4th, 1911).

ELECTRIC, AUTOMATIC, OR HAND-OPERATED INDICATOR OR SIGNAL COMBINING ADVERTISEMENT DISPLAY TO BE USED IN PUBLIC PLACES, BUILDINGS, VEHICLES, OR SEA AND RIVER-GOING VESSELS. A. G. Grundell. 28349. Dec. 9th.

MEANS FOR THE IGNITION OF LAMPS OF MOTOR VEHICLES. E. de F. Renouf. 29453. Dec. 21st.

ELECTRIC SWITCHES. British Thomson-Houston Co. (General Electric Co.). 29842. Dec. 27th.

1913.

ELECTRICAL SWITCHES. W. C. Horne. 764. January 10th.

TELEPHONIC SYSTEMS. E. A. Graham. 2022. January 24th.

SUSPENDERS FOR ELECTRIC CABLES AND THE LIKE. P. Huntington. 2449. January 30th.

PROCESS FOR MANUFACTURING ELECTRIC TRANSFORMERS OF SMALL POWER. Vedovelli, Priestley, et Cie. 4090. February 17th. (February 26th, 1912.)

RHEOSTAT. T. Rhodus. 4131. February 18th.

TELEPHONE ATTACHMENT. N. Marx. 4502. February 21st.

PENDANTS OR THE LIKE, AND MORE PARTICULARLY PENDANTS FOR ELECTRIC LAMPS. A. Luders. 5228. March 1st.

ACTUATING DEVICES FOR ELECTRIC CIRCUIT CLOSERS. G. D. Young. 5321. March 3rd. (March 29th, 1912.)

ELECTRICAL ADVERTISING SIGNS, DEVICES OR THE LIKE. L. Martin and G. Nixey. 5637. March 6th.

PROTECTING DEVICES FOR ELECTRIC CIRCUITS. Siemens Schuckertwerke Ges. 6164. March 12th. (March 12th, 1912.)

APPARATUS FOR REGULATING THE IGNITION OF INTERNAL COMBUSTION MOTORS. Sir A. W. Ruyssenaers. 6544. March 17th. (March 18th, 1912.)

CIRCUIT ARRANGEMENT FOR TELEPHONE EXCHANGES PROVIDED WITH SELECTING DEVICES. Siemens Bros. & Co., and T. Pettigrew. 7128. March 25th.

TELEPHONE CIRCUITS. Siemens & Halske Akt. Ges. 7130. March 25th. (March 23rd, 1912.)

MAGNETIC SEPARATORS. H. J H. Nathorst. 8485. April 10th. (April 18th, 1912).

TELEPHONE INSTRUMENTS, SETS ADAPTED FOR TWO LINES. Siemens Bros. & Co., and E. A. Laidlaw. 9167. April 18th. (Addition to 25673/12.)

COUNTERWEIGHTS FOR PENDANT ELECTRIC LIGHT FITTINGS. J. M. Doughty. 10422. May 3rd.

ELECTROLYTIC CELLS. E. C. R. Marks. (Hooker Electrochemical Co). 12206. May 26th.